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OPTICAL AND CHEMICAL STUDIES ON THE GRANULES IN MICROSPORES OF TRADESCANTIA

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Introduction

In certain stages in the development of the male gametophyte of *Tradescantia*, granules approximately 1–3 μ in diameter are present in relatively large numbers (pl. 31, fig. 1). They were observed by Hofmeister (1848), and Baranetzky (1880) figured them in meiotic stages in four different species. Sax and Edmonds ('33) noted that they disappear during growth and that they are relatively solid rather than fluid or plastic in consistency since they are not readily deformed by pressure on the cover-glass, and do not coalesce on contact. The latter also found that heating causes the granules to disappear.

Except for the statement of Sax and Edmonds ('33) that the granules are not composed of starch (based on a negative iodine test and a failure to observe birefringence), no information is available as to their chemical constitution. Because these granules play a significant role in certain cell processes (Johnson and Peck, '37) such information is highly desirable.

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The present investigation, undertaken at the suggestion of Dr. Edgar Anderson, is designed to furnish data of this sort.

Experimental Results

1. OPTICAL PROPERTIES

Since the optical analysis is applicable to fresh untreated cells and granules it was entered upon at the outset of the present investigation, not only in order to obtain information as to the molecular organization of the granules, but also with the hope that it might provide a criterion for their intactness in the subsequent chemical characterization.

Young microspores of *Tradescantia paludosa* were used, these being particularly suitable if separation from the tetrad has just taken place. Because of the extremely small size of the granules, the examination in polarized light requires a highly critical adjustment of conditions of illumination and compensation. We used a standard Leitz Model BM polarizing microscope and an intense source of illumination (Leitz Universal Lamp, bulb operated at five amperes). For clarity of definition of the polarization effects it is necessary to work with the polarizer and substage diaphragms stopped down to small apertures. Under these conditions each granule presents a clear-cut polarization cross between crossed Nicols, the dark arms of the cross being parallel with the planes of polarization of the polarizer and analyzer regardless of the position of the granule in the field (pl. 31, fig. 2). The latter fact was strikingly seen in fresh preparations where the granules were in continual Brownian agitation; it was demonstrated in fixed preparations by rotation of the stage.

In order to characterize the optical properties further it is necessary to determine whether the spherites are positively or negatively birefringent (for a discussion of the technique and interpretation of the polarization optical phenomena see Schmidt, '24, '34, '37). The gypsum-plate method is inapplicable in the present problem because the granules are too small and the birefringence is too weak to determine colors in the quadrants. The more sensitive Köhler rotating compensator

was therefore used, the retardation of the mica plate being $\lambda/20$. The compensator is inserted into the draw-tube slot and rotated until the field is maximally dark, the Nicol prisms being crossed. The granules then show the typical interference cross. Rotation of the compensator slightly to one side of this position causes one pair of the quadrants of the granule to become dark while the neighboring quadrants are bright. Rotation slightly to the other side causes the picture to become reversed; the quadrants which were previously dark are now light and vice versa. From the known optical characteristics of the compensator the spherites were shown to be positively birefringent.

Because of the small size of the spherites, it is difficult to deal with their optical properties quantitatively. When the microspores are immersed in water, compensation of the cross is attained by a rotation of only 4°–5° on the compensator dial; this would correspond to a retardation of the order of 3 to 4 $\mu\mu$. The diameter of the granules varies between 1 and 3 μ. On the assumption that the optical effects are due to a packing of crystallites with their optic axes (and probably also their long directions) oriented radially, the birefringence of the particles composing the granules may be calculated according to the method of Bear and Schmitt ('36, equation 11). Calculated in this way the birefringence is found to be of the order of magnitude of 0.005, a value not incompatible with the results of the following chemical characterization which indicates that the granules might be primarily of protein nature.

Immersion of the cells in balsam and in media of various other refractive indices, which was done in connection with the solubility experiments described below, shows that the form factor is relatively small, the birefringence being due primarily to intrinsic birefringence, a fact which might be expected from the apparently compact structure of the granules.

The polarization crosses, clearly visible when the optical conditions are satisfactorily adjusted, served admirably in the chemical work, not only to reveal the presence of the granules in unstained preparations but also as an index of the extent of action of the various reagents used. If the reagent had no effect on the optical phenomena it could have had little action on the

molecules, the organization and orientation of which give rise to the optical phenomena.

2. CHEMICAL AND PHYSICAL PROPERTIES

A. Microchemical Tests.—

In attempting to characterize the granules chemically, we first applied a series of microchemical tests which are more or less specific for certain groups in the proteins, carbohydrates, and fats. It was clear at the outset that such a search could be of value only if a positive test were obtained. Negative tests, while suggestive, are not conclusive because the granules are so small that unless the color developed is relatively intense it might escape detection. The tests proved uniformly negative and will therefore merely be listed briefly.

Lipoids: The granules are not stained by Sudan III and other fat-soluble dyes, nor are they blackened or even colored by osmic acid.

Proteins: The following tests for proteins or for characteristic amino-acid constituents of proteins were all negative: xanthoproteic, biuret, Millon, Raspail, Adamkiewicz, aldehyde, iodine, and lead-acetate sulphur. Certain of the tests are inapplicable to the granules as such, owing to the solubility of the latter in some of the reagents necessary for the test. For example, in applying the xanthoproteic test for protein and the Molisch test with alpha naphthol for carbohydrate, the concentrated acids dissolve the granules. Therefore, though the cell contents gave positive tests it is impossible to say that the dissolved granules were responsible rather than the constituents normally present in the protoplasm.

Carbohydrates: The following tests, based chiefly on the reducing power of carbohydrates, were all negative: Fehling's solution, iodine and potassium iodide with and without H_2SO_4, cuprammonia, chlorozinciodide, Mangin's iodine-calcium-chloride, Molisch with alpha naphthol and with thymol, ammoniacal silver nitrate. These tests were applied before and after attempted hydrolysis with 0.1 M. hydrochloric acid.

B. Enzyme Reactions.—

In the digestion experiments an objection may be raised that a negative result may simply mean that the enzyme, being a large protein molecule, may not be able to penetrate the cell wall and actually come in contact with the granules. To meet this objection, granules were also expressed from the cells and exposed directly to the action of the enzyme. The results of the experiments with diastase, pepsin, and trypsin are shown in table I.

TABLE I

THE EFFECT OF AMYLOLYTIC AND PROTEOLYTIC ENZYMES ON THE POLLEN GRANULES OF *TRADESCANTIA*. TEMP.—30° C.

Enzyme preparation	Effect on granules		
	after 48 hours	after 1 week	after 2 weeks
Diastase (sat. aq. sol.)	—	—	—
Pepsin (1% sol. in 0.1 N HCl)	—	—	—
Trypsin (1% aq. sol. pH 7.4)	+	+	+
Trypsin (1% aq. sol. pH 7.4, heat inactivated)	—	—	—

The symbol — means that the granules remain unaffected in shape and in appearance in the polarizing microscope; + means that the granules have been completely digested.

The tryptic digestion of the granules is relatively rapid and complete. Whether the negative results with pepsin mean that partial proteolysis is possible without interference with the state of aggregation of the granules, or that the material consists of relatively small molecules, is not clear.

C. Solubility Properties.—

To test the solubility of the granules in reagents the microspores were immersed in the solvents on slides and coverglasses waxed to the slides to prevent evaporation of the solvent. The slides were examined from time to time with the polarizing microscope, and the appearance and optical proper-

ties of the granules noted. Between the readings the slides were kept at a temperature of 25° C.

Organic Solvents: The granules were unaffected both in appearance and in optical properties by exposure for as long as two weeks to any of the solvents tried; these included ethyl alcohol, n-butyl alcohol, benzene, chloroform, ether, acetone, carbon bisulphide, and xylene. Similar results were obtained with mixtures in various proportions of benzene-alcohol, ether-alcohol, and xylene-alcohol, at various temperatures (see table II). This clearly rules out the possibility that lipoids enter into the structure of the granules to any significant extent.

Acids and Alkalies: Of importance in determining the general chemical nature of the granules is the action of acids and alkalies. It was found that while concentrated mineral acids readily dissolve them, they are not visibly affected by dilute mineral acids (0.1 M. HCl, HNO_3, $HC_2H_3O_2$, and H_2SO_4). On the other hand, 0.1 M. alkali ($NaOH$, NH_4OH) dissolves them almost completely in ten minutes and completely in thirty minutes. KOH seems to be effective only in slightly higher concentrations (0.5 M.). The process of dissolution and destruction of birefringence of the granules was readily observable under the polarizing microscope; there is no possibility that the granules were simply released from the cell by disruption of the cell membrane. On the assumption that the granules are primarily protein in nature, this effect is easily understandable, for alkali is well known to promote solution of certain proteins and by hydrolysis to cause certain relatively insoluble proteins to become soluble. Alkali is also known to have a destructive action on the birefringence of protein micelles and aggregates (Muralt and Edsall, '30). The fact that most mono- and disaccharides are soluble in dilute acid solutions, whereas the granules are not, is evidence against their being of a simple carbohydrate nature.

Urea: The granules do not dissolve even after long standing in water or dilute salt solutions (0.5 M. $NaCl$). However, in strong urea solutions they disappear with great rapidity. In a

typical experiment the cells were first examined in water and the presence of the granules with polarization crosses demonstrated. The urea solution was then applied. Almost before the cover glass could be adjusted and the microscope focused upon the cells, the granules had disappeared. This is not due to an optical effect, the similarity of the refractive index of the granules and the urea solution making them invisible, for in other media of similar refractive index the granules with polarization crosses were plainly visible. Moreover, the cells were subsequently stained with acetocarmine which, by staining the cytoplasm, brings out the non-staining granules more clearly; in none of the urea-treated cells could granules be demonstrated. Half-saturated solutions cause disappearance in ten minutes; lower concentrations are relatively ineffective. So long as the granules are visible in urea solutions they show a positive polarization cross.

It is known that even relatively insoluble denatured proteins are soluble in urea solution (Anson and Mirsky, '31) and that the birefringence of protein micelles may be rapidly destroyed by urea (Muralt and Edsall, '30; Bear, Schmitt and Young, '37). The action of urea therefore might be considered as further indirect evidence of the possible protein nature of the granules.

D. The Effect of Heat.—

Sax and Edmonds ('33) noted that the granules disappear on heating (no details of the temperature were given). Because of the possible bearing of the thermal data on the chemical identification, the effect of heat on the properties of the granules in a variety of media was studied. The microspores were placed on slides in the appropriate media, cover-glasses waxed on, and the slides put in a thermostated chamber, the temperature being held constant to ±1° C. After variable periods they were examined both with the ordinary and with the polarizing microscope. The data are summarized in table II. Each symbol in the table represents the effect of treatment for 24 hours at the given temperature, twenty separate determinations being made for each temperature and each medium. Ordinarily the

granules go into solution between 50° and 55° C., although there is some variability in the results and in a few instances the granules did not dissolve until boiled. No attempt was made to determine the destruction temperature with any great accuracy.

TABLE II

THE EFFECT OF TEMPERATURE ON THE GRANULES IN THE MICROSPORES OF *TRADESCANTIA*

Immersion medium	Temperature					
	35°	40°	45°	50°	55°	60°
Water	–	–	+	+	+	+
Formalin (10%)	–	–	–	–	+	+
0.1 M. HNO_3	–	–	–	–*	+	+
Alcohol (95%)	–	–	–	–	+	+
Benzene	–	–	–	+‡	+	+
Xylene	–	–	–	–	+	+

The symbol – means that the granules remain unaffected; + means that they have disappeared. There was some variation in the results, but in only two cases was this greater than 20%. * denotes a 35% exception and ‡ 40%. In the case of solvents immiscible with water the microspores were first dehydrated with absolute alcohol.

In water the granules become gradually more transparent and lose their spherical shape between 45° and 50° C. At somewhat higher temperatures they disappear completely. At temperatures slightly below their destruction temperature the bodies showed slight birefringence but no polarization crosses, possibly indicating that the original symmetry of packing of the ultraparticles had been destroyed.

Perhaps the reason why the granules of these microspores have received so little attention among cytologists is their apparent non-stainability. None of the stains used by us (safranin, fast green, methyl blue, acetocarmine, etc.) were effective, except to increase the contrast by staining the cytoplasm, the unstained granules then appearing clearly.

Another reason for the failure of the granules to appear in histological preparations is their sensitivity to heat. Except

under certain conditions, the temperature of the imbedding oven is sufficiently high to insure their destruction. It is known that certain cytological fixatives considerably increase the temperature necessary to produce shrinkage and disorganization of the protein components of certain tissues (Schmitt and Wade, '35, p. 173). To test whether fixatives tend to protect the granules against heat, anthers were placed in the following for two days: 10 per cent formalin, alcohol, and formol-acetic-alcohol. At the end of this period they were placed in the imbedding oven at 55° C. for two days. They were then removed, washed free of the fixative and the microspores examined for granules. In each case the granules were present in approximately unchanged shape. On the other hand, such material, when imbedded in paraffin and sectioned, showed no granules. The explanation of this is not clear but the best method for histological study appears to be fixation, followed by staining, running up through the alcohols and xylol, and mounting in balsam.

Summary

1. Studies have been made of the chemical and optical properties of the granules found in the microspores of *Tradescantia* in order to furnish a basis for an analysis of the role of these granules in cell function.

2. With critically adjusted optical conditions, viewed between crossed Nicol prisms, the granules present a positive spherite cross. This phenomenon has been tentatively interpreted as indicating that the granules are composed of fairly birefringent micelles oriented with optic axes radially disposed. This optical property serves admirably, not only as a criterion for the presence of the granules in unstained preparations, but for the intactness of their ultra-structure as well.

3. Microchemical tests for lipoids, carbohydrates, or proteins were inconclusive.

4. Trypsin effectively digests the granules, but pepsin and diastase are without effect.

5. Solubility data further limit the possibilities which need be considered with regard to their chemical composition. Pro-

longed extraction with a variety of lipoid solvents and of mixtures of solvents has no effect on the appearance and birefringence of the granules. They are insoluble in water, salt solutions, and dilute mineral acids but soluble in dilute alkali. The granules disappear rapidly in strong urea solutions.

6. Heating in water causes the granules to disappear in the approximate temperature range of 45°–50° C. Certain reagents, particularly certain cytological fixatives, increase the destruction temperature considerably. The possible significance of this for the histological investigation of the structures is pointed out.

7. The results so far obtained are best understood on the supposition that the granules are composed primarily of protein.

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Explanation of Plate

PLATE 31

Fig. 1. Photomicrograph of the microspores of *Tradescantia paludosa* in ordinary light, showing some of the refractive granules. Acetocarmine smear preparation. × approx. 725.

Fig. 2. Photomicrograph of a microspore of *Tradescantia paludosa* between crossed Nicol prisms. Note that each granule presents a clear-cut polarization cross, the dark arms of the cross being parallel with the planes of polarization of the polarizer and analyzer. Acetocarmine smear preparation. × approx. 910.

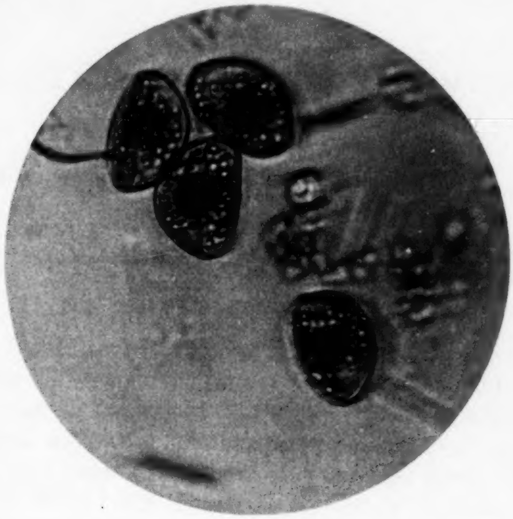

Fig. 1

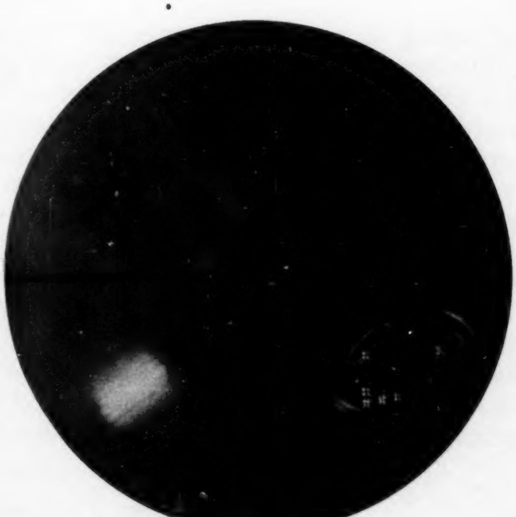

Fig. 2

SCHMITT AND JOHNSON — MICROSPORE GRANULES

THE SECOND BYRD ANTARCTIC EXPEDITION—BOTANY

I. Ecology and Geographical Distribution

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INTRODUCTION

The Marie Byrd Land Exploring Party of the Byrd Antarctic Expedition II returned after a three-months' intensive sledging journey to the expedition's base, Little America, in December, 1934, with an unusually large collection of mosses, lichens, and algae, native to the nunataks of that land. The location of Marie Byrd Land makes the collection of plants especially interesting, because of its high latitude, often regarded as an area beyond the limits of plant life. The collection is the largest which has been made south of the 70th parallel and includes at least seven species found by the Queen Maud Geological Party of the same expedition, three of which were growing as close as 237 miles from the South Pole at an elevation of more than 2000 feet.

The purpose of this paper is to discuss the geographic factors affecting their distribution and floristic affinities. The flora of the Antarctic is noted for its extreme paucity in forms, and the collections of specimens which have heretofore been made were in general more a matter of chance than of purposeful research and exploration.

The history of Marie Byrd Land dates from December 5, 1929, when Rear Admiral Richard E. Byrd (at that time Commander), U.S.N. retired, was leading a large American expedition to the Antarctic. During one of his historical flights along the coast to the east of his base camp, Little America, located in the Bay of Whales in the Ross Sea he discovered a land hitherto unknown and unclaimed. The British claim to the Ross Sea Dependency extends to the 150th meridian of west longitude, so

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that as he flew to the eastward from this meridian he was not only penetrating an unexplored land but an area which had not been previously claimed by any nation. Southward high elevations indicated snow-covered land, and just beyond the 150th meridian he sighted coastward rock exposures, the first he had seen since leaving the Rockefeller Mts. of King Edward VII Land, which had also been one of his discoveries earlier in the year.

As the peaks appeared on the horizon they were duly photographed and eventually located upon a reconnaissance map of the new land. The mountain systems he named the Edsel Ford Ranges, and the land was named in honor of the Commander's wife, Marie Byrd. Since conditions were impracticable for landing, field work could not be carried on within any of the mountains on the coastward end of this land to the north. Thus it remained the work of a second Antarctic expedition, again under the leadership of Admiral Byrd, in 1933–1935, to explore the new land.

Marie Byrd Land, a great triangular wedge with its apex at the South Pole and its base on the ice-guarded coast of the Pacific Ocean, is bounded on the west by the 150th meridian of west longitude and stretches eastward through twenty or more degrees of longitude. It lies almost midway along the coast between the two best-known sections of the Antarctic, Graham Land to the east, and South Victoria Land to the west. Its position, without known land bridges and facing along one of the broadest islandless sections of the Pacific Ocean, becomes more important in view of the fact that Graham Land and South Victoria Land are very different in their geological structure. Obviously they are not parts of one physiographic unit and some significant geomorphologic changes have taken place within the snow-covered expanse lying between them. Thus mid-position in the questionable area establishes the potential importance of the newly discovered coastal mountains of Marie Byrd Land.

The location of Marie Byrd Land also is of interest to botanists, for extensive collections of Antarctic mosses and lichens of the continent proper had been gathered only in Graham Land and in South Victoria Land. In the latter, certain affinities

were found to the lichens and mosses of Australia and New Zealand, while in the former some of the specimens were associated with those previously collected in South America, affinities which from their geographical location appear logical. However, the species of either region show little in common with those of the other. What characteristics of plant life might be exhibited in the land lying between these two more open sections of the Antarctic? The answer to this pertinent question became one of the major aims of the field party, part of the program of the second Byrd Antarctic expedition, which penetrated the territory on foot.

The writer was a member of the first, and of the second, Byrd Antarctic expeditions, and on both occasions was connected with the Biology Department. On the first expedition he served as nature observer in the vicinity of Bay of Whales. On the second expedition he was placed by Admiral Byrd in charge of organizing the Biology Department. Three full-time observers and one assistant formed the department, and in plans proposed it was agreed that the writer, because of his previous Antarctic experience, should be permitted to lead a small party into the coastal mountains to the east for special biological observations and reconnaissance. Admiral Byrd not only granted permission but recommended enlargement of the plans into one of the major field parties of the expedition.

Thus the Marie Byrd Land Exploring Party began. Associated with the writer on the adventure were F. Alton Wade, as Geologist, and Stevenson Corey and Olin Stancliff, as assistants and dog drivers. The party left Little America on October 14, 1934, and returned on December 29 of the same year. The men traveled on skis beside their three dog teams, later combined into two larger teams, which dragged on sledges all the equipment and food of the party.

The complete objectives of the party included: first, mapping the mountains by triangulation and solar fixes for ground control of the aerial photographic map which was to be constructed later; second, geological and glaciological study of the land; third, biological survey of the regions visited; fourth, magnetic observations wherever practical; and last, meteoro-

logical observations which would also serve by radio communications as guide to flying conditions when exploratory flights were projected eastward from Little America.

A chronological history of the trail journey is recorded elsewhere and need not be included.[1] The accompanying map shows the route taken by the party, and the following discussions include notations on the general conditions encountered. The journey was undertaken entirely in daylight, for only on nights of the first week or so did the sun dip below the horizon at midnight. Temperatures ranged from about -40° F. to 34° on extreme occasions, but averaged about zero or above during the entire journey. Aside from the loss of three dogs no casualties of serious consequence occurred.

The biological program of the party covered several distinct phases. The results of zoological observations included one new rookery of snowy petrel on Mt. Helen Washington in the Rockefeller Mts. of King Edward VII Land, and a skua gull retreat on Skua Gull Peak. The microbiological work included many aseptically-taken samples of rock, plants, snow, stagnant water, mud, etc., from which many colonies of bacteria and moulds have been separated for identification; and in samples of ice and water numerous infusoria, rotifers, water bears, etc. were collected and photographed by cinema and still microshots. The botanical phase of the work included the collection of mosses, lichens, and algae from as many locations as could be examined and from which specimens could be gleaned.

Plant specimens were collected by searching diligently on all exposures of rocks and in likely crevices wherever the party stopped. Typical pieces of each kind of moss or lichen were taken from each location where the form was found, and wherever practical with attached bits of the substratum the better to preserve the plant intact. In some areas density of plant life was too great to obtain more than random samples, while in other places where life was more sparse nearly every available

[1] Byrd, R. E. Discovery, the story of the second Byrd Antarctic Expedition. i–xxi, 1–405. illus. G. P. Putnam's Sons, New York, 1935.

Siple, P. A. Scout to explorer, back with Byrd in the Antarctic. i–xiv, 1–239. illus. G. P. Putnam's Sons, New York, 1936.

specimen was taken. The plants were placed in small wooden or cardboard boxes, and the more delicate specimens were individually wrapped in tissue paper. As the success of a polar trail usually depends upon concentration of the load of supplies, nearly every item at the start is reduced to a minimum to permit maximum amount of food (which determines the maximum length of stay in the field). The party had not been aware of the density of plant life, and consequently the supply of containers was scant. Less than a hundred small boxes were taken, and bags and other odd containers were borrowed from the galley equipment to help transport the unlooked-for richness of the finds. The collection was packed in a strong protective box and not disturbed to any extent until turned over to Dr. Carroll W. Dodge and to Mr. Edwin Bartram. Each box of specimens was labeled by its own serial number and by the number of the peak on which they were found, as corresponding to the survey of the unnamed mountains.

Simultaneously with the departure of the Marie Byrd Land Sledging Party to northwestern Marie Byrd Land, the Queen Maud Geological Party departed for similar reconnaissance in the mountains of southern Marie Byrd Land near the 150th meridian of west longitude between 85° and 87° of south latitude. Quin A. Blackburn, geologist, was leader of the party, ably assisted by Stuart D. L. Paine and Richard S. Russell, Jr. Although their interest lay principally in studying and mapping the geology of this region, they kept watchful eye for any plant life which might occur. It is to their credit that they engaged themselves so well in their search that they brought back at least eight different species of lichens so small as likely to have escaped any casual observer, but representing the most southerly existing flora so far recorded in the world, and indicating that these mountains support a far less luxuriant growth of plants than do the coastal ranges.

The success of the two major field parties could not have been achieved had it not been for sincere cooperation of the entire expedition. The technical staff at Little America helped in equipping the party and preparing the dogs, while supporting parties of dog teams and tractors materially aided by laying

depots of food supplies in early stages of the journeys. The Marie Byrd Land Sledging Party was particularly fortunate in having its depots laid as far as Mt. Grace McKinley and in having a thousand pounds of food laid down at that point by a Citroen tractor manned by Harold I. June, Kennett L. Rawson, and Carl O. Peterson.

PHYSICAL FACTORS AFFECTING DISTRIBUTION, AND SOME APPARENT ECOLOGICAL ADAPTATION

To understand better the conditions which permit a flora on Marie Byrd Land, it seems well to evaluate the environmental factors of the plants and to note some of their apparent adaptations to the rigorous conditions of their habitat.

Geological and glacial factors.—The mid-position of Marie Byrd Land, between Victoria Land to the west, Graham Land to the east, and the Queen Maud Mountains to the south, gave rise to most intriguing geological observations.

From rather meager data it is concluded that the sequence of geological events in the history of Marie Byrd Land was as follows: "deposition of a great series of arkosic sandstones and shales on the pre-Cambrian basement rocks, close folding of this sedimentary series accompanied by the deep-seated intrusion of acid magma, a long period of erosion, glaciation, and the extrusion of olivine basalt during the Pleistocene."[2]

The eroded coastal ranges are remnants of highly metamorphosed sediments resting as broken synclines upon massive intrusions of granites and eruptives, and show little definite relation to the Queen Maud Mountains to the south which are surmounted by lofty flat-lying beds of fossil and coal-bearing sediments. The rocks show a structural similarity to those of the Graham Land region to the east and an affinity in chemical composition to the ranges of South Victoria Land to the west but differing in most other respects from either.[3]

[2] Wade, F. Alton. Petrologic and structural relations of the Edsel Ford Range, Marie Byrd Land, to other Antarctic Mountains. Bull. Geol. Soc. America 48: 1387–1395. *3 pl. 2 fig.* 1937.

[3] The geological references for this article have been supplied by F. Alton Wade, geologist Marie Byrd Land Sledging Party, by special notation and adaptations

The exposures along the coast appear as peaks recently emerged from the glacial ice-covering which caps the entire continent of Antarctica. Extensive areas of fracture suggest that the ice, relieved of its pressure near the coast, is dropping rapidly into the sea and exposing the coastal peaks. South of the coast the snow mantle rises until it inundates all the highest peaks and continues at an increasing elevation toward the Queen Maud Mountains which again thrust their loftier summits through the snow cover. Whether or not the land is continuous is one of the most hotly disputed questions regarding the structure of the Antarctic, and satisfactory proof remains yet to be elicited by sonic depth soundings.

The Edsel Ford Ranges of Marie Byrd Land are coastal. However, they assume the character of inland peaks because they are included within great fields of shelf and pack-ice frozen out into the ocean, and many of the peaks are 50 and 100 miles from the nearest open leads of water and hundreds of miles away from the nearest ice-free seas. The peaks have been heavily glaciated by over-riding continental ice pushed seaward from the center of the continent, as indicated by empty cirques, hanging valleys, glacial striae, and many other features of erosion and morainic deposition, now revealed above the ice. Recent retreat has lowered the ice level along the coast until the peaks have emerged as nunataks.

It is thus apparent that until recently ice covered the entire land, even eroding the highest pinnacles until no vestige of residual soil or plant life remained on them. Only the peaks are bare of ice, and support vegetation.

The accompanying table presents the petrographic description of the common rock types and mineral composition as determined by microscopic analysis. The fineness of grain of the sedimentary metamorphics has made analysis of them by this method impossible. Though chemical analyses are not yet available, description of the rocks is included.

from his doctorate thesis on the geology of Marie Byrd Land, at the Johns Hopkins University: "Northeastern borderlands of the Ross Sea: glaciological studies in King Edward VII Land and Northwestern Marie Byrd Land." Geog. Rev. **27**: 584–597. *16 fig.* 1937.

CHEMICAL ANALYSIS OF SOME OF THE IGNEOUS MOUNTAINS IN THE EDSEL FORD RANGES OF MARIE BYRD LAND, COMPILED BY F. ALTON WADE

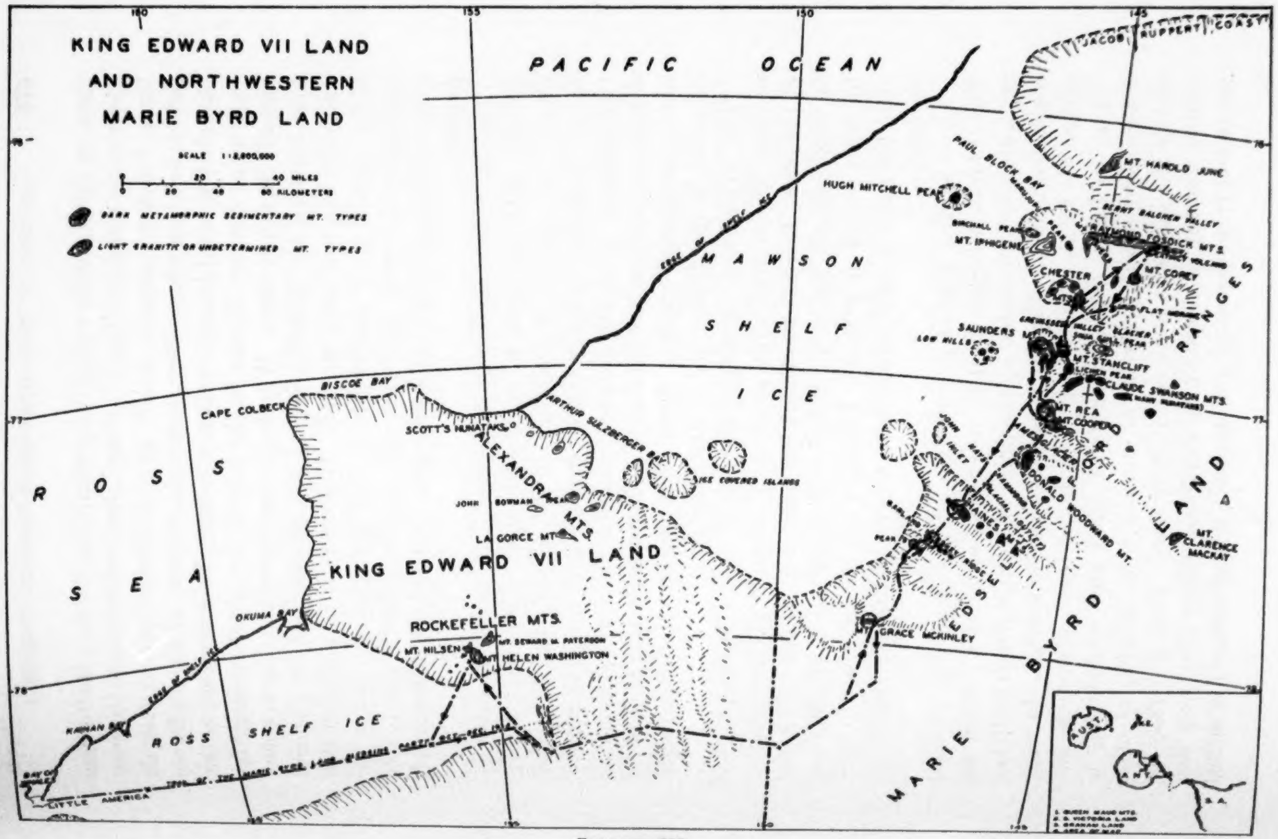
	1	2	3	4	5	6	7	8	9
SiO_2	74.	74.	41.	72.	67.	62.	66.	55.	68.
Al_2O_3	15.5	14.3	21.6	15.7	17.9	20.8	19.2	22.	17.3
K_2O	3.5	8.6		7.9	4.3	5.0	5.8	4.2	8.9
No_2O	6.7	1.2	2.6	3.1	2.7	3.4	3.1	4.1	4.0
CaO		1.4	9.5	0.42	3.6	4.2	3.5	5.6	0.4
M_2O			5.6	0.17	1.2	1.4	0.8	1.0	0.2
FeO		p*	9.0	0.17	2.6	2.5	1.4	3.2	0.3
Fe_2O_3		p	7.2		0.4	0.3		3.4	p
H_2O	0.13	0.08	2.7	0.07	0.4	0.4	0.2	0.3	0.06
P_2O_5	p*	p	p	p	p	p	p	0.6	p
CO_2			0.4		p	p			
Cl_2, F_2	p	p	p	p	p	p	p	p	p
ZrO	p	p	p	p	p	p	p	p	p

p* = present in very small amounts.

1 = Leuco-sodaclase granodiorite (gray granite), N.W. Ridge, McKinley.
2 = Leucogranite (coarse pink granite), McKinley.
3 = Porphyritic diabase (black dike), N.W. Ridge, McKinley.
4 = Leucogranite (pink granite), Rea.
5 = Granodiorite (gray granite), north peak, west side, Saunders.
6 = Granodiorite (gray granite), south peak, west side, Saunders.
7 = Sodaclase granodiorite (gray granite), S.E. exposure, Chester Mts.
8 = Granodiorite (massive central mass), Raymond Fosdick Mts. near Volcano.
9 = Leucogranite, Corey.

Several of the mountains exhibited on the surface of the rocks calcareous deposits which were collected as possible plant life, especially at Mt. Stancliff, Lichen Peak, and Skua Gull Peak, all rich in plant life.

The accompanying map portrays the general distribution of the dark metamorphic sedimentary peaks flanking the intrusive cores of contrasting light-colored granitic rock. As may be seen in the table, distribution of plant life in general seems to be a little denser on the darker mountain peaks


KING EDWARD VII LAND
AND NORTHWESTERN
MARIE BYRD LAND
PACIFIC OCEAN
MAWSON SHELF ICE
ROSS SEA
ROSS SHELF ICE
KING EDWARD VII LAND
ROCKEFELLER MTS.
ALEXANDRA MTS
MARIE BYRD LAND
BISCOE BAY
CAPE COLBECK
SCOTT'S NUNATAKS
OKUMA BAY
LITTLE AMERICA
MT. NILSEN
MT. HELEN WASHINGTON
LA GORCE MT.
JOHN BOWMAN
ICE COVERED ISLANDS
GRACE MCKINLEY
HUGH MITCHELL PEAK
PAUL BLOCK BAY
MT. HAROLD JUNE
JACOB RUPPERT COAST
MT. IPHIGENE
CHESTER
MT. COREY
SAUNDERS
LOW HILLS
MT. STANCLIFF
CLAUDE SWANSON MTS.
MT. REA
MT. COOPER
DONALD WOODWARD MT.
MT. CLARENCE MACKAY
RANGES

See page 503.

than on the granitic rock, due perhaps to the fact that darker rocks more quickly absorb the sun's heat and produce temperatures for the support of life over a longer period than do lighter-colored ones. The chemical analyses of the rocks are included to enable any reader who may be interested in this somewhat obscure factor in the life of the plant to gauge for himself its importance. Whether or not there is a direct connection between the distribution of the plants and the chemical analysis has not been proved. However, it is apparent that some species show preference either for granitic rock or for metamorphic types, that some are decidedly indifferent to rock composition, and some of either grow best where bird guano is present.

On Mt. Grace McKinley the plant life varied in color decidedly with the type of rock exposures, dikes, etc.; for example, two species of *Umbilicaria (U. rugosa* and *U. cerebriformis)* blended in color almost exactly with a dike of porphyritic diabase, while the coarse-grained granite of the mountain supported seven other species of lichens, including none of the above-mentioned species. Somewhat similar relationships will be noted in the discussion of distribution.

The writer was extremely surprised at the apparent effect of plant life in producing an unusual amount of disintegration of the rock. It led to the following note in his diary: "It would be surprising to know the relative disintegration by plant and by frost action at present. I should not be surprised to learn that they are nearly equal here where plants are almost unthought of."

Close search almost everywhere with a hand lens revealed tiny plants wedged in the inter-crystal cracks. When the crystals were separated by the point of a knife lichen thalli and algae were often discovered on the under-surface. In many places the rocks were so badly weathered that soil material had begun to form. Small pockets of sand and boulder clay in places supported growths of mosses and lichens; at other points the deposits were completely bare. Most generally the plants seemed to respond to localities where they were best protected from the wind and assured of some supply of melted

snow. In plate 33, fig. 2, and pl. 34, fig. 4, plant life is seen growing in small wind-excavated pits on a horizontal granitic surface at Mt. Grace McKinley. Such pockets caught a small quantity of snow which melted to temporary pools of water along whose margins *Alectoria antarctica* was afforded time to grow quite well.

Light.—The light regime through the whole of Antarctica is regulated chiefly by high latitude. The entire continent lies south of the Antarctic circle and the area from which plants were taken in Marie Byrd Land ranges from 76° 30′ to 86° 3′ of south latitude. Therefore a four to five months' period with continuous sunlight exists in summer, a similar period with no direct sunlight in the winter, and the remaining months transitional. While the maximum elevation of the sun is about 36° 30′ in the northern coastal ranges of Marie Byrd Land, it is only a little more than 28° at the apparent limit of southern growth of macroscopic plant life. The elevation of the midnight sun varies respectively in these same localities from less than 10° to 18°.

The extremely low angle of the sun's rays forces them to pass through great thicknesses of atmosphere with consequent elimination of much of their intensity. However, the unusually clear atmosphere of the polar regions, result of the reduction of moisture in the air by low temperatures, and the multiple reflections of the sun's rays across the white snow crystals producing some polarization, tend to compensate for the otherwise ineffective angle of the sun.

That certain light factors are reduced considerably was proved by the reaction of the photographic film used by the entire camp. Most of the film was super-sensitive panchromatic, for which the light-meter calculations indicated fabulously high speeds as compared with regions of lower latitude, but which required much wider apertures and slower speeds to prevent the continuous tendency to under-exposure. Some of the retardation of the film was no doubt caused by lower temperatures. However, the reaction was quite obvious at temperatures slightly below freezing.

The quality of the light through multiple reflection and even from diffusion through heavy clouds was so intense during the summer months that to go without satisfactory sun glasses for more than an hour or so meant a painful attack of snow-blindness. It even affected those wearing inferior glasses.

Two special adaptations which plants apparently made to Antarctic light conditions were unusually dark colors and selective distribution. Most lichens were decidedly black, while others were dark green, gray, brown, or red. Only few types exhibited light colors. In most cases these were of small size, which permitted them to utilize absorbed sun's heat indirectly from moss clumps or from dark rocks upon which they grew. In general their colors were much darker than those of more common lichens of warmer latitudes.

The second reaction, that of distribution, revealed itself in the lack of a specific pattern of orientation, i. e., the plants were not more common on the north side of mountains than on the south. Moreover, lichens were in many places found on the under side of rocks which received only reflected light. One striking example of this was at Mt. Rea-Cooper where a small cave, facing towards the south with a roof sufficiently sloping to allow moisture to run across it by adhesion, supported a luxuriant mass of *Parmelia*. As was true in most cases, this lichen was associated with a super-growth of a species of *Polycaulonia* or *Blastenia* which are red, branching forms, while *Parmelia* is flat and gray, extending usually over wider area than more brightly colored types.

Temperatures.—To study the factors of temperatures affecting the growth of plant life the meteorological records taken by Amundsen in 1911–12, and by Byrd in 1929–30 and again in 1934–35 are available.

The latitude of Little America corresponds approximately with the southern border of northern Marie Byrd Land and the weather regime of the two places may be assumed to be about the same, but tending to minimum rather than to maximum conditions in the latter. The mean yearly temperature as recorded in 1934 was found to be about –12.85° F., while the

mean maximum was but -3.23° F. and the mean minimum was sinking to -22.4° F. In contrast to the warmest temperatures recorded, the minimum was that of just below -72° F. which from the 1929 records and from Amundsen's figures would appear to be about average.

With return of the sun, temperature rises but there is an apparent lag of a month or more before temperatures become much higher. The mean temperature of the summer months, i. e., those months with continuous sunlight, is about 8.75° F. The two months receiving greatest insolation show a mean of 20° F. January is the warmest month with mean of nearly 24° F.

On eighteen days in 1929 and eleven days in 1934 the maximum temperature rose above freezing, while only on January 21 and 22, in 1929, were mean daily temperatures of 32° and 33° F. recorded. Ten unusually warm days continued from January 20 to 29, 1929, during which the maximum daily temperature was: 29°, 37°, 42°, 35°, 35°, 38°, 39°, 30°, 28° and 33° F. However, mean temperatures for these days were correspondingly as follows: 20°, 32°, 33°, 28°, 26°, 27°, 26°, 18°, 15° and 22° F., indicating, no doubt, such maximum heating of the air as occurs in regions with no rock exposures to absorb and to increase the heat by radiation. Very little melting takes place on the surface of the snow. Snowflakes change to crystalline névé and considerable ablation takes place, yet any dark objects lying on the snow usually sink down into it very rapidly, while the whiteness of the snow protects it, by reflection, from melting.

July, August, and September are the coldest months, with a mean of about -37.5° F. Even though each of these months has one or more days when the temperature rises to zero or above (days always accompanied by blizzards of föhn nature from the east), the monthly mean minimum temperature sinks below -48° F.

Diurnal temperature variations are marked but rather erratic. The Antarctic is characterized by its sudden changes in temperature, particularly in winter when it may rise or fall more than 50° within less than twenty-four hours. The coldest

periods are usually accompanied by calms and clear sky, the warmer periods generally by föhn-like blizzards from the east or southwest.

Only a short distance above the surface of the snow during the colder periods the temperature makes a rapid inversion, becoming much warmer by comparison, which might mean that the loftier mountain summits are subjected to warmer air and that their accompanying plant life is exposed to less rigorous minimum temperatures.

It seemed apparent to the observers in the field that as they progressed farther north in their journey through northern Marie Byrd Land the climate became milder. It was somewhat difficult to compare the meteorological records of the party with those at Little America, but they did show several degrees higher temperature on the average. It does not seem unreasonable to assume that in the northern exposures of Marie Byrd Land temperatures may average as much as 10° higher than at Little America, for almost uniform gradation was shown in the temperature records at the Bolling Advanced Weather Station, where Admiral Byrd spent the winter night alone, just south of the 80th parallel with a mean average of about 10° lower than Little America.

The Edsel Ford Ranges were from one to two degrees farther north than Little America, but, more significantly, they extended farther out into the sea, where maritime conditions had a moderating effect. Even though the sea is covered for many miles northward with great floes of heavy pack ice, the open leads of water not only tend to warm the air, but yield much moisture in the form of fog. The fog drifts in from the coast, and as it crystallizes and precipitates it must give off much latent heat which helps to moderate the coastal climate.

The Queen Maud Mountains to the south, however, probably have temperatures averaging from 10° to 30° lower than those to the north.

Additional evidence of milder climate in the mountains lying north of the 77° parallel of latitude was the occurrence of several extensive areas of so-called "blue ice lakes." One of these lay to the west of Lichen Peak and around the base of the

volcano. After returning to camp, melting of discolored ice from this place revived algae, infusoria, rotifers, and water bears. Mt. Helen Washington is also sheathed in glare ice, which cost the 1929 expedition one of its airplanes when the wind lifted it from its glassy moorings. The most striking example of milder climate was discovered on the summit of Skua Gull Peak, a peak so distinctly surrounded by a deep moat that it appeared to be nothing but a small rock until the depth of the trench was realized. The mountain was visited on December 4, before the warmest part of the year, and already very little snow remained on the surface. A low depression on the crest of the mountain served as a catchment basin for melted snow and formed a pond one or two hundred yards long and several inches deep, upon which a light crust of ice had formed (pl. 35, fig. 2). The bottom of the pond was full of ooze and foul-smelling muck, while the sides were encrusted with algae and bird remains. The little pond was nicknamed the "robbers' hang-out," from numerous evidences of skua gulls. Disgorged bones and feathers of the snowy petrel indicated that the scavenger skuas must come here to rest and digest their meals, but no direct evidence of nesting could be discovered, although there was no disputing that the peak had long been sanctuary to a multitude of the large birds. It is no small wonder that with milder climatic conditions, dark rocks absorbing more of the sun's heat, sheltered from wind, and enriched by bird droppings, plant life of this mountain surpassed all others in luxuriance, with possible exception of Mt. Helen Washington of King Edward VII Land, which was itself a rookery of snowy petrel. There again mildness of weather was evidenced by blue ice, although it is questionable whether the position of the mountain is one of great shelter from the winds that are prevalent there. Certainly it is a region of frequent fogs.

The sun's rays upon the rocks have strong heating effect. Black bulb readings have indicated temperatures as high as 120° F. It was often customary for travelers in the region to strip almost naked for comfort while skiing beside the panting dogs. Sunburn was as blistering on the men's faces as freezing had been a few weeks before. There were occasions when the

warm rocks invited a welcome siesta, and within the little orange-covered tents the heating effect of the sun was so great that a man was at times forced to lie on top of his sleeping bag instead of in it, even on occasions when the actual air temperature was well below freezing. A cloud over the sun immediately produced a sensation of chill.

Temperature conditions afford many occasions when plants may thrive for brief growing periods, but the plants must be adapted to unfavorable temperature changes any instant. In general, lichens seem to have many common characteristics which can be associated with their temperature surroundings, i. e., they have for the most part remained so small that they can hardly be noticed with the naked eye; their colors are usually dark to absorb the sun's rays more readily; further, the algal portion has remained buried deep within the structure of the plant. The mosses seem to have overcome most of their handicaps by their caespitose habit. They grew only on mountains which had most favorable conditions and were not found in the Queen Maud Mountains.

Wind.—Wind in the Antarctic promotes the loss of heat, abrasion of plant parts by drifting snow crystals, fracture of plant parts, and distribution of spores and asexual reproduction of the plants.

An area of "low" high pressure is recognized in the vicinity of the South Pole, a snow plateau about 10,000 feet high. As the pressure builds up in the center of the continent the air slides outward in anticyclonic spread. Northward moving air gains velocity as it reaches the coasts of the continent, and rotation of the earth deflects the air to the left, giving strong easterly component. The rush of air is intensified by the descending gradients along the radii of the domed continent, and in places, such as Queen Mary Land, the velocity may be as much as 150 to 200 miles per hour with a yearly mean of 50 to 60 miles per hour. However, on the surface at Little America no velocities of more than about 75 miles per hour were recorded. The outward flowing air is replaced by higher inflowing warm air from the northwest drawn downward to complete the circulation, and consequently even more heated and dried in accord-

ance with true aspect of adiabatically heated föhn winds. An area of constantly low pressure just off the coasts to the north over the warmer sea draws the air outward into the formation of a continuous procession of cyclonic storms moving constantly from the west to east just south of the area of predominant westerlies. Occasionally these cyclonic storms drift inland, carrying fog and snow with them, and often the upper air moving in above the continent brings in considerable quantities of heavy clouds.

Strong winds often drive quantities of sharp-pointed crystals of surface snow before them, little crystals which must often abrade the soft tissues of the plants like a sand blast if snow does not drift about them as protection. The driving wind often breaks loose whole sections of plants and hurls them across the snow, perhaps to other mountain tops where they may find convenient foothold to continue life. The path of outward blowing wind must have a strong bearing upon the distribution pattern of the plants asexually as well as by spores.

When lowest temperatures occur the weather is usually calm, as has been pointed out, and permits organisms to withstand cold that might otherwise be lethal. The warmth of the föhn wind brings a rise in temperature which may prevent excessive loss of heat by making the temperature gradient between the plant and its environment less steep. Men suffer most when air drains from higher slopes. Because of its density it tumbles downward like a cataract without time to warm up. These katabatic winds are usually local but may cause almost instantaneous freezing of the flesh. They are among the most painful factors encountered in polar climatic conditions. Plants of mountain tops may escape the frigid blasts because of their positions upon elevations above the snow fields, and may in places attain enough height to be in the path of the inblowing warmer winds.

Another response possibly due to wind is location of plant life in protected spots where it may be covered by drift snow in times of wind, snow which later serves as a moisture supply when melted by the sun on the heated rocks. Such plants as *Usnea* suggest tiny lignified trees and their branching and

flexibility allow them to withstand strong blasts of air. Most lichens exposed to strongest winds are so firmly attached to the rocks that they can hardly be removed without serious breaking. Spreading types clinging tight to the surface of the rocks are subjected only to ravages of existing snow, while the *Umbilicaria, Parmelia,* and related forms hold their flat thallus close to the surface of the rock, probably as much to profit from the warmth, to remain reduced in size and to conserve moisture, as to keep protected from the wind. The diminutive size of many species gives them small surface area, a primary protection against the wind.

Precipitation, evaporation and available moisture.—The relative humidity of the Antarctic coastal zone is often indicated by measurement to be quite high, but the absolute humidity is, of course, very low because of the inability of the cold air to hold much moisture in suspension. Vapor from the breath lingers for long periods in cold weather, and may be seen to sink slowly if the atmosphere is calm enough. At temperatures of −50° F. or below crystallization of the vapor becomes distinctly audible.

Often fogs of "sea smoke" rolling inland from the ocean hold moisture in such critical suspension that it is deposited as sheets of ice or crystals of hoar frost upon the first objects they meet.

It is almost impossible to measure precipitation exactly. High winds carry such quantities of loose drift along the surface that snow drifts several feet high may form in a few hours with or without any additional precipitation. Dr. Hobbs points out in his theory of glacial anticyclones that much precipitation must occur in the interior of Antarctica and Greenland by fine crystals dropping from cirri in the descending upper atmosphere. The adiabatic outward winds then cause a drying effect so that the edges of the continent may exhibit thinner coverings of snow and ice due to greater drying effect of the warmer, drier air. Some areas just in from the coast in Greenland do show similarity to desert country. However, if such conditions do exist undiscovered in Antarctica the area of the coastal ranges of northern Marie Byrd Land probably ex-

tends out into the marine influence sufficiently to receive more than the average amount of precipitation. Several heavy snow falls were experienced by the exploring party, and fogs as well as crystal deposition were common during the period of exploration.

Ablation and drifting are the chief methods of dispersion of the inland surface névé. It is only where dark rocks project that heating overcomes reflection and permits actual melting of the snow. Even so, the extension of watery areas is very small, for shortly after the water strikes the snow surface it freezes again. It is natural, as has been mentioned before, that plants are found growing most plentifully along avenues of small trickles of water where loose material has accumulated. Some of the little stones lying in the path of the intermittent water had as many as six to ten different species of lichens clinging to them.

Polar conditions are really those of a typical desert, and plant life must be able to adapt itself to them. Many small lichens, some almost microscopic in size, are bud-like in shape and resemble true succulent plants. Their small size requires little water to carry on growth and reproduction. Other large forms have hairy under-surfaces to aid in obtaining water. An adaptation of some types of lichens is to grow on top of moss clumps until the moss is no longer able to live. The dead moss plant, however, still holds much moisture, which remains available as though in a sponge, long after the surrounding rocks have dried up. Even moss plants take advantage of the older growths of dead leaves beneath to protect them and to provide a source of water. The greenest and most hardy-looking clumps of moss are those that have built up adequate supply of "undergrowth."

As has been mentioned, two of the mountain peaks which were most luxuriant in their floral display were host to bird inhabitants. It cannot be certain, however, whether it is the presence of the birds which has encouraged the more luxuriant growth of lichens, mosses, and algae, or whether the same climatic factors which have made these two mountains more desirable as a rookery than the neighboring peaks may not be

the most desirable also for plant growth. While Skua Gull Peak is host to transient McCormick skua gulls, probably because of the presence of a fresh-water pond well sheltered from the wind, the neighboring Lichen Peak, only about seven or eight miles away, is almost as rich in numbers of species even though it bears no evidence of bird life, and the wind has blown small rock fragments over the ice several miles to the west in veritable drifts that were hazards to the sledge runners of the field party. Saunders Mt. also serves as a retreat for McCormick skua gulls.

Mt. Helen Washington, the only collecting point in King Edward VII Land, was the breeding place of snowy petrel. However, from the numbers of birds circling about overhead it was likely that neighboring peaks also served as rookeries for both the snowy petrel and Antarctic petrel. In fact, Lieutenant Prestrud, of Amundsen's Norwegian Expedition,[4] visited Scott's nunataks and reported evidences of a bird rookery there as well as rather extensive presence of plant life.

Snowy petrel were seen flying over Mt. Haines, and during our absence from Mt. Grace McKinley a bird visited an exposed bacteriological plate, which proves that birds do frequent many of the peaks.

DISTRIBUTION OF PLANT LIFE

The detailed description of each species of lichen or moss gives the locality from which it was collected; therefore, the following discussion need deal only with generalities and description of individual peaks. The mountain peaks are grouped as metamorphic sedimentary mountains, or as granitic mountains, following the route of the trail journey from west to east.

Metamorphic Sediments and Associated Dike Rocks

Garland Hershey Ridge: 77° 38′ S.–147° 15′ W.—Three small exposures were visited in the ridge of nunataks lying between Mt. Grace McKinley and Haines Mts. The exposures are all

[4] Amundsen, R. E. G. The south pole: an account of the Norwegian Antarctic Expedition in the Fram, 1910–1912. Tr. A. G. Chater, London. J. Murray, 1912. [See 2: 395.]

low and apparently have only lately melted out of the ice-covering of snow. Only two species were found, both growing on orthoclase-sericite schist and dark gray slate.

Buellia grisea and *Lecidea Byrdii.*

Haines Mountains: 77° 30′ S.–146° 45′ W. (Pl. 33, fig. 4).—Much more extensive than Garland Hershey Ridge are Haines Mountains, but only the most northerly exposures, which probably yielded best growth conditions for plant life, were visited. Most of the mountain was composed of sericite schist which weathered with evidence of much iron. Exposures of orthoclase-sericite-siderite schist were characterized by square pits of dissolved minerals and extensive iron stains.

This was one of the regions of less dense growth and no mosses were found. *Alectoria antarctica, Buellia alboradians, B. floccosa, B. grisea, B. muscicola, B. pallida, B. stellata,* and *Usnea antarctica.*

Mt. Donald Woodward: 77° 18′ S.–145° 50′ W. (Pl. 36, fig. 5; pl. 37, fig. 4).—Of several scattered exposures lying between John Hays Hammond Inlet (outlet glacier) and Ames Glacier, Mt. Donald Woodward is the northernmost and largest. Better climatic conditions were revealed here by the first appearance of tiny clumps of moss and more numerous species of lichens, but the mountain had a sparse flora in comparison with the more northern peaks of the land. Much plant life grew over clumps of moss or on loose sandy loam, derived from the predominant rock type which was biotite-sericite schist.

Growing loose, easily detached, on clumps of moss or sandy loam: common—*Lecidea Siplei* and *Gasparrinia Siplei* (the only species found both on rocks and loose); occasional—*Catillaria floccosa, Lecanora griseomarginata, Parmelia leucoblephara, Pyrenodesmia Darbishirei, Usnea frigida. Grimmia Antarctici* and its var. *pilifera* were the only mosses found.

Growing on biotite-sericite schist: common—*Buellia flavoplana* (only on this mountain but described from S. Victoria Land), *B. grisea, B. stellata, Gasparrinia Siplei, Lecidea capsulata, Rhizocarpon flavum,* and *Thelidium inaequale;* occasional—*Alectoria antarctica, Buellia dendritica, Kuttlingeria rufa* (endemic), *K. rutilans, Parmelia leucoblephara, Polycauliona pulvinata, Protoblastenia alba* (endemic), and *Thelidium Caloplacae.*

Lichen Peak: 76° 55′ S.–145° 20′ W.—One of the numerous mountains of the Claude Swanson group, located just northeast of Mt. Rea-Cooper is Lichen Peak. Although subjected

to much wind, in places it exhibited luxuriant growths of plant life—mosses, lichens, and small, dark, irregular masses of algae resembling *Nostoc*. The mountain rises smoothly above the snow surface without the usual wind moat at the contact line. The surface of the mountain was broken into fine talus on the lee side, and rock chips were strewn for miles in drifts piled westward over the ice. The mountain is composed mainly of sericite-orthoclase schist, gray slate, and arkosic sandstone. Because the two latter types are more friable, fragments are easily plucked out by wind, and plant life is less abundant on them.

Growing on gray slate: *Lecanora lilacina*, *Lecidea Siplei*, and *Parmelia variolosa*.

Growing on arkosic sandstone: very common—*Usnea frigida*; common—*Lecidea capsulata*; occasional—*Blastenia grisea* (endemic) and *Lecidea Coreyi*.

Growing on sericite-orthoclase schist: very common—*Alectoria antarctica*, *Buellia frigida*, and *Candelariella albovirens*; common—*Lecidea capsulata*, *L. Coreyi*, *L. Stancliffi*, *Parmelia leucoblephara*, and *Usnea frigida*; occasional—*Buellia albida*, *B. alboradians*, *B. grisea*, *B. muscicola*, *B. stellata*, *Huea flava*, *Pannoparmelia delicata*, *P. pellucida* (endemic), *Protoblastenia alba*, *Rhizocarpon flavum*, *Sarcogyne grisea*, *Thelidium inaequale*, and *Umbilicaria spongiosa*.

Growing loose, easily detached, on moss clumps or on loose sandy loam: very common—*Alectoria antarctica*, *Catillaria floccosa*, *Lecidea Siplei*, *Protoblastenia flava*, and *Pyrenodesmia Darbishirei*; common—*Parmelia variolosa* and *P. Coreyi*; occasional—*Blastenia succinea*, *Buellia Siplei*, *Candelariella chrysea*, *Lecanora griseomarginata*, *L. lilacina*, *L. lilacinofusca*, and *Umbilicaria spongiosa*. The mosses were *Barbula Byrdii* and *Sarconeurum glaciale*.

Skua Gull Peak: 76° 50′ S.–145° 30′ W. (Pl. 35, figs. 2, 4; pl. 36, fig. 2).—This mountain mass, referred to several times in the preceding text because of the comparative luxuriance of its plant life (mosses, lichens, and algae), its odd formation surrounded by a deep depression, and the pond located upon its summit which is host to transient skua gulls, lies just two or three miles east of Saunders Mt. but is geologically of an altogether different origin. Mt. Stancliff is a larger and eastern exposure of the same mountain mass, and together they form a northern outlier of the Claude Swanson Mountains separated five or ten miles from the central mass of those peaks. While Mt. Stancliff appears to be sericite schist and fine-grained dike rock, there is more abundance of dark greenish gray slate on Skua Gull Peak, and also more of the

pitted orthoclase-sericite-siderite schist similar to that on the northern end of Haines Mts.

Growing on dark greenish gray slate: very common—*Gasparrinia Siplei, Lecanora griseomarginata, L. Siplei, Protoblastenia flava, Pyrenodesmia Darbishirei, Parmelia variolosa,* and *Umbilicaria cerebriformis;* common—*Blastenia succinea, Buellia dendritica, B. olivaceobrunnea, Catillaria cremea, C. floccosa, Parmelia griseola, Protoblastenia aurea, Thelidium Caloplacae,* and *T. parvum;* occasional—*Candelariella alboviren*s.

Growing on orthoclase-sericite-siderite schist: very common—*Gasparrinia Siplei, Lecanora Siplei, Protoblastenia flava,* and *Usnea frigida;* common—*Buellia albida, B. olivaceobrunnea,* and *Thelidium Caloplacae;* occasional—*Buellia muscicola, Lecidea Siplei, Polycauliona pulvinata, P. sparsa, Rinodina sordida* (endemic), and *Umbilicaria rugosa.*

Growing on fine-grained dike rock: very common—*Alectoria antarctica, Gasparrinia Siplei, Lecanora Siplei, Polycauliona pulvinata, Pyrenodesmia Darbishirei, Umbilicaria cerebriformis, U. rugosa,* and *Usnea frigida;* common—*Protoblastenia aurea, Umbilicaria pateriformis,* and *Usnea antarctica;* occasional—*Biatorella arachnoidea, Buellia albida,* and *Lecanora carbonacea* (endemic).

Growing loose, easily detached, on clumps of moss, or on sandy loam: very common—*Gasparrinia Siplei, Lecanora griseomarginata, Parmelia Coreyi, Protoblastenia flava, Pyrenodesmia Darbishirei,* and *Usnea frigida;* common—*Alectoria antarctica* and *Blastenia succinea;* occasional—*Kuttlingeria rutilans, Lecidea Siplei, Polycauliona sparsa, Umbilicaria spongiosa,* and *Usnea antarctica.* The following mosses were collected: *Bryum antarcticum, B. Siplei, Barbula Byrdii, Grimmia Antarctici,* and *Sarconeurum glaciale.*

Mt. Stancliff: 76°51′ S.–145°20′ W. (Pl. 35, fig. 1).—Closely associated with Skua Gull Peak, a smaller twin nunatak lying immediately to the west, is Mt. Stancliff. It helps to shelter Skua Gull Peak from wind and is consequently not so rich in plant growth, but far surpasses Haines and Woodward Mountains. The mountain appears as a low nunatak from the west, but on the east it exposes a much bolder face as the ice drops away from it into the wide crevassed glacier valley. The beds of the mountain were less contorted and mostly composed of sericite schist and fine-grained dike rock. The plant collection was taken from the eastern end of the exposure. Mosses were present but not very plentiful.

Growing on sericite schist: common—*Lecidea capsulata* and *Rhizocarpon flavum;* occasional—*Buellia albida, B. floccosa, B. olivaceobrunnea,* and *Gasparrinia Siplei.*

Growing on fine-grained dike rock: common—*Rhizocarpon flavum;* occasional—*Polycauliona pulvinata* and *Huea flava.*

Growing on a single piece or erratic pink granite: occasional—*Alectoria antarctica* and *Sarcogyne grisea.*

Growing loose, easily detached, on clumps of moss or on sandy loam: occasional—*Lecidea Siplei* and *Protoblastenia flava*. Probably some species of *Usnea* occurred on this mountain but failed to be collected.

Granitic Mountains

Mt. Helen Washington: 78° 05′ S.–155° 20′ W. (Pl. 32, figs. 2, 3; pl. 33, fig. 5).—The mountain contacted last by the field party upon its return journey had previously been visited by Dr. L. M. Gould and party, as well as by Admiral Byrd who came to Gould's rescue when his plane blew away in a strong blizzard on the 1929 expedition. Time permitted for studying the region was cut short by the reduced food supply and by orders for the party to return to Little America. It was the only exposure visited in King Edward VII Land. A rookery of snowy petrel on the summit and frequent fogs and consequent milder climate furnish conditions for an extensive cover of mosses and lichens on every suitable location. Very recent subsidence of the ice is apparent from a distinct band above which *Usnea* is so dominant as to give the mountain of pink granite a blackish green tint, noticeable even from the airplane. However, below the line, which resembles a coastal high-water line, stretches a band of bare rock from 20 to 100 feet or more wide, comparatively free of *Usnea* or other growths. At the present contact between the snow cover and the bare rocks of the nunatak is a zone of melting, which when prodded by the point of a ski pole yielded fragments of bright green algae. Algae were in many places found matted on rocks and in tiny pools of water, which under the microscope revealed other small organisms. On the summit mosses and lichen forms usually associated with them were enriched by bird droppings, but *Usnea* and *Umbilicaria* grew luxuriantly, mainly because of milder climatic conditions. As stated before, the area surrounding the mountain is sheathed in glare ice. This is pitted by great accumulations of rock fragments which have melted into the surface but still show through. The mountain is composed mostly of coarse-grained pink granite with a few large crystalline quartz veins, and inclusions of highly weathered greenish granite in which orthoclase is dominant. Although

there was some variation in the distribution of plant life on different rock types, the differences are slight and may be due to irregularities in collecting. The mountain top was so plentifully covered that only a comparatively few of the specimens could be taken and identification in the field was impossible.

Growing on coarse-grained pink granite, coarse-grained pinkish leucogranite, white quartz crystals and quartzite, and weathered coarse-grained green granite: very common—*Alectoria antarctica, Candelariella albovirens, Protoblastenia flava, Umbilicaria cerebriformis, U. rugosa, U. cristata, U. pateriformis,* and *Usnea antarctica;* occasional—*Buellia dendritica, B. muscicola, B. olivaceobrunnea, B. Russellii, Catillaria granulosa* (endemic), and *Lecidea cancriformis.*

Growing loose, easily detached, on clumps of moss, or on chips of rock or sandy loam: very common—*Alectoria antarctica, Protoblastenia flava, Rinodina olivaceobrunnea, Umbilicaria rugosa, Usnea antarctica,* and *U. frigida;* common—*Buellia muscicola, Protoblastenia aurea,* and *Umbilicaria cerebriformis;* occasional—*Catillaria floccosa, Polycauliona pulvinata,* and a sterile yellow species found also on Mt. Grace McKinley. The mosses were *Bryum Siplei* and *Grimmia Antarctici* and its var. *percompacta.*

Eggshells, bones, and some rock surfaces were covered with dry patches of algae and abundant mosses.

Mt. Grace McKinley: 77° 55′ S.–148° 15′ W. (Pl. 33, fig. 2; pl. 34, figs. 2–4).—Mt. Grace McKinley, the most westerly exposure of Edsel Ford Ranges, was the first mountain visited, and a month later it was revisited on the return journey. Continental ice pushes up from the south and almost over the mountain, while the north side drops steeply with a cirque-cut face several hundred feet high. The mountain was not rich in its flora, principally because most of the rock exposed was vertical and inaccessible, and secondly, the slight evidence of melting around the exposures suggested that the temperatures were less favorable for plant growth than other mountains farther north in Edsel Ford Ranges. The western exposure appeared as a mere "peeping-through" of rocks, but actually the ridge was 20–50 feet wide and more than 100 yards long. Three types of rock appeared in the exposure—fine gray granite, pegmatite granite, and a highly weathered dike of porphyritic diabase; the latter displayed a distinct type of species which blended almost imperceptibly with the greenish color and texture of the rock. The main mass of the mountain is composed of coarse-grained pink leucogranite.

Growing on leucogranite (coarse pink granite): common—*Alectoria antarctica, Lecidea Coreyi, Protoblastenia aurea, Usnea frigida;* occasional—a sterile yellow species found also at Mt. Helen Washington.

Growing on leuco-sodaclase granodiorite (fine-grained granite) and crypto-crystalline pinkish granite near dike contact on west end of mountain: common—*Lecidea Coreyi* and *Usnea antarctica;* occasional—*Lecidea Stancliffi, Umbilicaria cerebriformis,* and a sterile yellow species found also at Mt. Helen Washington.

Growing on weathered dike of porphyritic diabase. Plants often growing loose or easily detached on small chips of rock. No other fine loose material occurred on the mountain except an apparently sterile pegmatite vein of quartz, beryl, and biotite. Common—*Umbilicaria cerebriformis* and *U. rugosa.*

Mt. Rea-Cooper: 77° 07′ S.–145° 30′ W. (Pl. 33, fig. 3; pl. 34, figs. 1, 5; pl. 35, fig. 3; pl. 36, figs. 1, 3; pl. 37, fig. 3).—Because it represents twin masses of the same mountain structure, divided by a narrow glacier-carved gap, this mountain is referred to by a double name. The mass was first sighted on the exploratory flight of December 5, 1929, and named Mt. Rea, which name now is applied to the northern exposure, while the southern is named Mt. Cooper. Actually the field party contacted Mt. Cooper for most of its observations, but knew both exposures as Mt. Rea. In early literature and geological publications description of both peaks was included under the name Mt. Rea, but here it seems wise to use both names. The mountains are composed of coarse-grained leucogranite which stands out in bold ice-carved relief with sheer cliffs rising 1000 feet or more. Conspicuous inclusions of stoped metamorphic rocks are often exhibited along the crest of the mountains, as are occasional dikes of granodiorite, etc. Most of the plant collection was made along the lower exposures, moraines, and talus slopes where access to the mountain was easiest. Many plants grew on stones in crevices where water trickled on warm days. Mosses were common but not so abundant as at Chester Mts., Mt. Helen Washington, Lichen Peak, or Skua Gull Peak.

Growing on coarse-grained leucogranite (light pink), also on coarse-grained granodiorite: very common—*Buellia brunnescens,*[8] *B. chrysea, B. dendritica,*[8] *Lecidea ecorticata,*[8] and *Rinodina sordida;* common—*Alectoria antarctica, Catillaria arachnoidea,*[8] *C. floccosa,* and *Usnea frigida;* occasional—*Buellia stellata, Catillaria*

[8] These species were found on no other mountain, but were relatively abundant on this mountain, which might suggest that such species may have a wider distribution than at present known.

inconspicua, *Lecanora lilacina*, *L. subolivacea* (endemic), *Lecidea capsulata*, and *L. Stancliffi*.

Growing loose, easily detached or on sandy loam formed from leucogranite: common—*Catillaria floccosa*, *Polycauliona pulvinata*, and *Protoblastenia flava;* occasional—*Blastenia succinea*, *Buellia (Diplotomma) Siplei*, *Huea flava*, *Lecidea Wadei*, *Parmelia variolosa*, *Rinodina olivaceobrunnea*, and *Thelidium parvum*. *Grimmia Antarctici* and its var. *pilifera* were the only mosses collected.

Saunders Mt.: 76° 52′ S.–145° 45′ W.—Saunders Mt., just north of the Rea-Cooper group, and the largest exposure of Edsel Ford Ranges, is composed mostly of coarse-grained gray granodiorite. The southern end, visited by the writer, was strikingly devoid of plant life. The western side, visited by Wade and Stancliff, yielded plant species typical of the larger conspicuous forms found at Mt. Rea-Cooper, including moss, *Usnea, Alectoria, Parmelia,* etc. This incomplete collection was carefully placed in a sterilized vial for bacteriological samples and was used for that portion of the biological survey. It is unlikely that there were any new or unusual species in the small collection. Disgorged bones and feathers gave evidence that skua gulls use the northern end of Saunders Mt. as a retreat, as they do at the neighboring Skua Gull Peak.

Chester Mts. (southeast peak): 76° 40′ S.–145° 20′ W. (Pl. 37, fig. 5).—One of the most northerly nunataks of floral importance visited by the field party was the southeast peak of Chester Mts. Although small, the exposure was the only one approachable from the south. Mosses appeared unusually green and fresh, and cushions were often several inches in diameter. Structure of the mountain, coarse-grained gray granodiorite with occasional quartzitic veins and other inclusions, was similar to that of Raymond Fosdick Mts. which neighbor it. Although the mountain was about thirty miles farther north than Mt. Rea-Cooper it had fewer plant forms, a condition possibly due to a south-facing stope in direct sweep of prevailing easterly blizzards.

Growing on coarse-grained granodiorite: common—*Candelariella chrysea* and *Catillaria floccosa;* occasional—*Alectoria antarctica*, *Buellia dendritica*, *B. frigida*, *Catillaria inconspicua*, and *Protoblastenia flava*.

Growing on quartzitic vein material: occasional—*Buellia stellata*, *Candelariella albovirens*, *Lecidea capsulata*, and *Sarcogyne angulosa*.

Growing loose, easily detached, on moss clumps or on sandy loam: common—*Candelariella chrysea* and *Catillaria floccosa*; occasional—*Parmelia leucoblephara.*

Mt. Corey: 77° 25′ S.–144° 35′ W. (Pl. 37, fig. 1).—Lying just south of the volcano of Raymond Fosdick Mts., Mt. Corey is a small exposure closely related to two neighboring exposures of coarse-grained pinkish leucogranite. It stands conspicuous on the northern brink of the depression leading down into a wide-crevassed glacial valley, which served as an effective barrier to wider exploration in the region, and was the scene of three accidents which nearly brought disaster to the field party. Because of its isolated position, some of the plant specimens were collected under sterile conditions for bacteriological investigation. In general, vegetation was very sparse as compared with other mountains just to the south, perhaps because of its recent emergence from the retreating ice cover.

Growing on coarse-grained leucogranite: common—*Usnea antarctica* and *U. frigida;* occasional—*Alectoria antarctica* and *Candelariella albovirens.* The mosses were *Grimmia Antarctici* and *Sarconeurum glaciale.*

Mt. Raymond Fosdick and the Volcano: 76° 34′ S.–144° 15′ W.—These peaks are included in the discussion principally because they were the most northerly mountains visited and were more nearly devoid of plant life than any other exposure. Climatic conditions could hardly account for sparseness of vegetation, for one of the most pronounced "blue ice lakes" borders the base of the volcano, which indicates melting temperatures. A medial moraine extends southward a mile from the volcano and is composed of basic lava with conspicuous inclusions of bright green olivine. The lava weathers easily and the moraine contains much fine, dusty material.

Rising above the volcano to the north is the main backbone of the Raymond Fosdick Mountains. It is composed of contorted gneisses formed when the volcano erupted on its southern side. The exposure was visited toward the close of a three-day blizzard which made searching for plant specimens difficult. Whether the peak was devoid of plant life one cannot be absolutely certain, but apparently it had no more vegetation than the volcano and moraine which were searched diligently under more favorable conditions.

In contrast to the lack of lichens and mosses was the abundance of microscopic life in a small pond of ice formed in the moraine at the foot of the mountain. The pink color of the ice attracted attention, and small samples were taken and later melted at Little America. Under the microscope red rotifers, water bears, infusoria, and algae began a vigorous rejuvenation of life. The original source of these organisms can only be guessed at.

The nearest bird life observed in this vicinity was at Skua Gull Peak and at Saunders Mt. nearly 40 miles "down wind," i. e., away from prevailing wind.

Several assumptions may explain lack of vegetation in the volcano vicinity: that mountain and moraine may have been too recently uncovered to have received a plant cover; that prevailing easterly winds would tend to bring less spores to the mountain because there are few nunataks to the east; that the black porous lava becomes quickly heated by the sun and evaporation follows too rapidly to support vegetation—in fact, the moraine was dusty dry; that some chemical in volcanic material may be unsuitable for plant growth; that the position of the range on the south side might permit less light, a condition similar to the south side of Saunders Mt., but in opposition to the luxuriant growth of Mt. Helen Washington; and lastly that air drainage may have been a factor, for heavy winds pour down the mountain, as evinced by orientation of snow drifts.

Queen Maud Mts.—The plant specimens obtained by the Queen Maud Geological Party were collected at two stations, incidental to geological investigation,[6] and there are few notes on distribution. The forms are unusually interesting because they are the most southerly plants thus far recorded in the world, and three, as mentioned before, were found within 237 nautical miles of the geographical South Pole. This is considerably farther poleward than land plants grow in the Arctic, due to lack of islands or nunataks in the Arctic Sea. The plants were growing in small crevices on granites and

[6] Blackburn, Quin A. The Thorne glacier section of the Queen Maud Mountains. Geog. Rev. 27: 598–614. *25 fig.* 1937.

schists, and were generally tiny forms rather easily detached. They grew also on chips of rock and sand. No mosses were found.

Three of the lichens are also found in the mountains of Marie Byrd Land and King Edward VII Land, two of them sterile. The rest are endemic. A species of *Hormiscium* parasitizes some thalli and appears the same as that to the north.

Durham Point (Durham Mt., N.E. portal of Thorne Glacier): approximately 85° 31′ S.–151° 20′ W.; elevation 1200 ft.—

Growing on fine-grained granite (deep olive buff), granitic sandy loam, dark brownish gray schist, and other schists: common—*Lecidea cancriformis* (also in King Edward VII Land) and *Protoblastenia citrinigricans*; occasional—*Alectoria antarctica, Buellia Russellii, B.* sp. (sterile), *Lecidea Blackburni, Lecanora fuscobrunnea*, and *Hormiscium* sp.

Scudder Mt.: 86° 03′ S.–150° 40′ W., between Organ Pipe Mts., Mt. Bruce Harkness and Mt. McKercher: (Pl. 36, fig. 4; pl. 37, fig. 2.—

Growing on granitic sandy loam, easily detached: common—*Lecidea Blackburnii, L. cancriformis, Protoblastenia citrinigricans*; occasional—*Lecidea Painei*.

From the factors governing growth of plants and their distribution upon different nunataks, a few generalities and observations suggest themselves. They are enumerated to aid readers who are interested in studying more closely the pattern of distribution of such plant species as are pioneers upon a glaciated land simultaneously with the retreat of the ice. It is difficult to explain what factors have made so many species endemic to this polar land without known affinities in warmer latitudes; but perhaps in warmer climates other plant forms crowd out polar flora, or the polar species may not be properly adaptable to conditions in warmer latitudes, customarily considered more ideal for plant growth. On the other hand, polar conditions may have forced the plants arriving from the outside world to adopt new forms with altered specific characteristics in order to exist under such rigorous and dry conditions. The following pages are a summary of the species and their general distribution characteristics.

Distribution and substrates	Plants	Number mts. where found	Remarks
Mosses extending into both Graham Land to the east and South Victoria Land to the west	*Sarconeurum glaciale* *Bryum antarcticum*	3 1	
Lichens extending only into South Victoria Land to the west, which lies in the path of prevailing easterly winds blowing from Marie Byrd Land	*Usnea antarctica* *Protoblastenia aurea?* *Buellia frigida* *Buellia flavoplana*	5 2 2 1	*Protoblastenia aurea* is doubtfully included here, as the material from South Victoria Land is sterile
Moss extending only into Graham Land to the east, from which prevailing easterly winds blow to Marie Byrd Land	*Grimmia Antarctici*	6	
Lichens widely distributed on both dark metamorphic sediments and on granitic mountains	*Alectoria antarctica*	11	Widest distribution of any species, from Queen Maud Mts. to almost all coastal mountains
	Usnea frigida	7	Most conspicuous species and probably most abundant; very hardy but sterile
	Candelariella albovirens	7	Wide distribution but not very numerous
	Catillaria floccosa *Protoblastenia flava*	6	Usually growing loose or easily detached where mosses were found
	Usnea antarctica	4	Much less abundant than *Usnea frigida*
	Buellia sp. (sterile)	4	Wide distribution including Queen Maud Mts., King Edward VII Land, and Marie Byrd Land, but not abundant
Lichens widely distributed between granitic and dark metamorphic sedimentary mountains	*Buellia muscicola* *Buellia dendritica*	4	Not abundant, distribution similar for both species.
	Polycauliona pulvinata	4	Not abundant and usually associated with *Parmelia* sp., upon which it seemed to be growing
	Umbilicaria rugosa	3	Abundant where found, seeming to require dark weathered rocks

Distribution and substrates	Plants	Number mts. where found	Remarks
Lichens widely distributed on both granitic rocks and dark metamorphic sedimentary rocks, apparently preferring the former	*Usnea antarctica*	5	Widely distributed on igneous mts. and on dark sedimentary mts. restricted to Skua Gull Peak
	Umbilicaria cerebriformis	3	Grows under conditions similar to *U. rugosa*
Lichens widely distributed on both granitic and dark metamorphic sedimentary rocks, apparently preferring the latter. On only one granite mountain	*Buellia stellata*	5	Only on an igneous erratic at Mt. Stancliff
	Buellia grisea *Lecidea capsulata*	5 4	Commonly on sericite schist
Lichens on peaks of different material 40–50 miles apart; none abundant	*Lecidea Coreyi* *Lecidea Stancliffi*	2	On Mt. Grace McKinley and Lichen Peak
	Lecidea Wadei	2	On Mt. Rea-Cooper and Garland Hershey Ridge
Moss and lichens growing on different rock structure but localized on neighboring moun tains	*Catillaria floccosa* *Parmelia variolosa* *Blastenia succinea*	3	On Mt. Rea-Cooper, Lichen Peak, and Skua Gull Peak
	Candelariella chrysea	2	Loose or easily detached on Chester Mts. and Lichen Peak
	Buellia frigida *Parmelia leucoblephara*	2 3	Same peaks as above but on rocks, the last species also on Mt. Donald Woodward
	Grimmia Antarctici var. *pilifera*	2	On Mt. Rea-Cooper and Mt. Donald Woodward
	Buellia Siplei	2	Loose or easily detached on Mt. Rea-Cooper and Lichen Peak
	Buellia chrysea	2	On rocks, Mt. Rea-Cooper and Lichen Peak
	Buellia pallida	2	On rocks, Mt. Rea-Cooper and Haines Mts.
Moss and lichens growing on or near mountains wher bird life is present; correlation uncertain	*Buellia olivaceobrunnea* *Umbilicaria pateriformis* *Protoblastenia aurea* *Bryum Siplei*	3 2 2 2	On Mt. Helen Washington and Skua Gull Peak; first species also on Mt. Stancliff

Distribution and substrates	Plants	Number mts. where found	Remarks
Lichens growing only on igneous rocks	*Lecidea cancriformis*	2	Wide distribution, on Mt. Helen Washington and Queen Maud Mts.
	Rinodina olivaceobrunnea	2	On moss clumps or sandy loose material at Mt. Rea-Cooper and Mt. Helen Washington
	Catillaria inconspicua	2	On rocks in restricted locality on Mt. Rea-Cooper and Chester Mts.
Moss and lichens only on dark metamorphic sedimentary mountains (schists and slates); widely distributed	*Lecidea Siplei* *Pyrenodesmia Darbishirei* (sterile)	4	Both species growing loose or easily detached on mountains where mosses are common
	Lecanora griseomarginata *Barbula Byrdii*	3	Wide distribution, growing loose or easily detached
	Gasparrinia Siplei *Rhizocarpon flavum*	3	Restricted distribution but abundant; commonly on rock
Lichens widely distributed on two dark sedimentary mountains	*Thelidium Caloplacae* *Kuttlingeria rutilans*	2	On Mt. Donald Woodward and Skua Gull Peak
	Thelidium inaequale	2	On sericite schist, Mt. Donald Woodward and Lichen Peak
	Buellia alboradians	2	On sericite schist, Lichen Peak, and Haines Mts.
	Buellia floccosa	2	On sericite schist, Haines Mts., and Mt. Stancliff
Lichens with limited distribution on two or more dark metamorphic sedimentary mountains	*Buellia albida*	3	On sericite schist, Mt. Stancliff, Lichen Peak, and Skua Gull Peak
	Catillaria cremea *Parmelia Coreyi* *Umbilicaria spongiosa*	2	On Lichen and Skua Gull Peaks. The second is more abundant, the last is the largest species
	Huea flava	2	On rocks, Lichen Peak and Mt. Stancliff
	Sarcogyne grisea	2	On rocks, Lichen Peak and Mt. Stancliff, at latter on erratic igneous rock
Lichens growing on igneous schists and endemic to Queen Maud Mts.	*Lecidea Blackburni* *Lecidea Painei* *Protoblastenia citrinigricans* *Lecanora fuscobrunnea* *Buellia Russellii*	1	Growing nearest the South Pole, collected by the Queen Maud Geological Party

Distribution and substrates	Plants	Number mts. where found	Remarks
Moss and lichens growing only on a single igneous mountain	*Buellia brunnescens* *Buellia dendritica* *Lecidea ecorticata* *Lecidea Byrdii* *Catillaria arachnoidea* *Lecanora subolivacea*	1	Growing on coarse-grained leucogranite, Mt. Rea-Cooper; usually on small rocks in small trickles of water. First three species very common
	Grimmia Antarctici var. *percompacta* *Catillaria granulosa* *Umbilicaria cristata*	1	On coarse-grained leucogranite, Mt. Helen Washington
	Sarcogyne angulosa	1	On quartzite, Chester Mts.
Lichens growing sparsely on a single mountain of dark metamorphic sedimentary rocks	*Biatorella arachnoidea* *Lecanora carbonacea*	1	On dike rocks at Skua Gull Peak
	Rinodina sordida *Polycauliona sparsa*	1	On sericite schist, Skua Gull Peak
	Umbilicaria spongiosa *Parmelia griseola*	1	On rocks at Skua Gull Peak, but easily detached
	Blastenia grisea *Pannoparmelia pellucida* *Pannoparmelia delicata*	1	On sericite schist, Lichen Peak
	Lecanora lilacinofusca *Lecanora lilacina*	1	Loose or easily detached, Lichen Peak; mosses common
	Kuttlingeria rufa *Buellia flavoplana* *Protoblastenia alba*	1	On sericite schist, Mt. Donald Woodward

SUMMARY

From thousands of plant colonies reviewed in the field and hundreds brought back to the laboratory for identification, at least 89 species of lichens and 5 of mosses are determined. The lichens were collected from some 215 distinct localities on 12 mountains, and represent not only a random cross-section through Marie Byrd Land and King Edward VII Land, but rather diverse conditions as well. On 8 of the 12 mountains there were relatively few mosses. Where they were most abundant, lichen forms were also most numerous.

Of the two dominant rock types in the region, dark metamorphic sedimentary rocks and the loftier igneous rocks, based

on observations made in northwestern Marie Byrd Land, two-thirds of the plant species were found on the former type, probably because snow melts faster on dark rocks than on light-colored granitic rocks. Mt. Stancliff, with its accompanying Skua Gull Peak, surrounded by larger mountains on all sides, lies within the central zone of mountain exposures and represents a focus of abundance in plant growth. The warming effect of lower latitude is obvious, but more important are the factors of available moisture and shelter from wind.

Mt. Helen Washington, with its snowy petrel rookery (pl. 33, fig. 5), exhibits remarkable abundance of plants, but the number of species is little more than half that of Skua Gull Peak where birds are fewer. Even Mt. Rea-Cooper and Lichen Peak, devoid of bird life, have more species than Mt. Helen Washington, a response perhaps to shelter from wind or to a warmer latitude of one degree farther north. While Mt. Helen Washington lies to the south of the elevated mass of King Edward VII Land, the former is more exposed to the north.

The fact that all species of mosses and lichens in the collection are endemic to the Antarctic, if not to the locality, brings the question of origin strongly to the foreground. Several different conclusions might be suggested, but the writer feels that no definite proof is possible in the light of meager data from other sections of Antarctica and adjacent land masses.

First, it might be conjectured that plant spores have existed in crevices of rock, imprisoned in ice or suspended in upper atmosphere, and represent an ancient flora of Antarctica before the ice age, which has once more found a foothold on the denuded peaks. However, lack of endemic genera casts immediate doubt upon such a conclusion.

If then, as an alternative, it is concluded that plant spores have been transported to the continent from land masses to the north, distribution within the continent demands explanation. If spores are so widely distributed within Antarctica, why should not some of the forms escape or more common forms enter? Answers to this question lie in the fact that perhaps still too little is known about alpine lichens of the Andes, Australia, New Zealand, and of the intermediate islands. It is

possible that common species entering the Antarctic must make such rapid adjustments to new conditions that the speed of evolutionary processes to form new species is hastened as plants adapt themselves to the rigor and dryness of the new climate.

Wind has probably been the most instrumental means of distributing plant spores, and to a lesser extent redistributing locally broken vegetative parts from peak to peak. Ice and water have had an active but more limited part in the processes. Detailed study may possibly prove to what extent birds help in disseminating spores. It must be kept in mind that snowy petrel, McCormick skua gull, and Antarctic petrel are natives of Antarctica and have a range that in general does not extend much beyond the northern limit of the pack ice, although occasionally the birds pass the 50th parallel. If they have aided in distributing spores and plant parts, it may have been through island bridges, or, as is more likely, they have been of greater aid in redistributing plant life after it entered the continent than in actually helping to introduce it.

The writer concludes that the most important part played by birds is enrichment of rock exposures with guano. It is apparent that two of the mountains exhibiting the greatest wealth in quantity of plants were those which had visiting bird life. On the other hand, many surrounding mountains, almost as luxuriant in growth, have species not represented on mountains visited by birds. Climatic and shelter conditions which made mountains desirable for birds were also conditions conducive to optimum plant growth within the region. If the bird-frequented mountains, i. e., Skua Gull Peak and Mt. Helen Washington, had representatives of all of the species found elsewhere, the argument for bird distribution of spores would be very strong, but such was not the case. In further support of bird activities, it should be recalled that every inland party going toward Queen Maud Mts. has reported the appearance of occasional skua gulls, which may take solitary flights directly across the continent. However, only three of the Queen Maud species found by the Byrd expedition had affinities with coastal species.

The collection made by the Marie Byrd Land party represents, no doubt, the majority of the larger and more conspicuous species, but as may be seen from the data, most of the mountains had species apparently restricted to them. Of mountain exposures where plant life probably exists, less than 10 per cent of the area has been visited. No doubt more than twice as many species prevail as have been found; and if the regions could be charted much more information concerning the distribution factors of the plants lying on the poleward margin of plant growth would be available.

There is need for more collecting. Even in the regions which have been visited most frequently, it is likely that only a few of the lichen species have been brought back for identification. Most observers not especially interested in plant life would overlook all but the most obvious plants, for the majority of the lichens appear as little more than crumbs of dirt on rocks. Keen search for plant growth will be necessary in the future for more complete collections from the continent. Specimens from the coasts bordering the Indian Ocean and from the mountains discovered recently by Lincoln Ellsworth east of Marie Byrd Land will be especially valuable.

The British Graham Land Expedition led by Rymill, which returned in 1937, has made a collection of plants which, when identified, will throw more light upon plants to the west of Graham Land.

In the light of observations made within Marie Byrd Land it seems probable that the plant species of Antarctica are much more numerous on the continent proper than the one or two hundred known species thus far collected would indicate.

Acknowledgment is due Commander H. E. Saunders for the map (page 475) of King Edward VII Land and northwestern Marie Byrd Land, which was drawn from the reconnaissance map now in preparation by him. The map was constructed from aerial photographs and ground-control survey made by the Marie Byrd Land Sledging Party, the route of which is shown. Shaded portions are conjectured edges of the land mass and should not be considered definite.

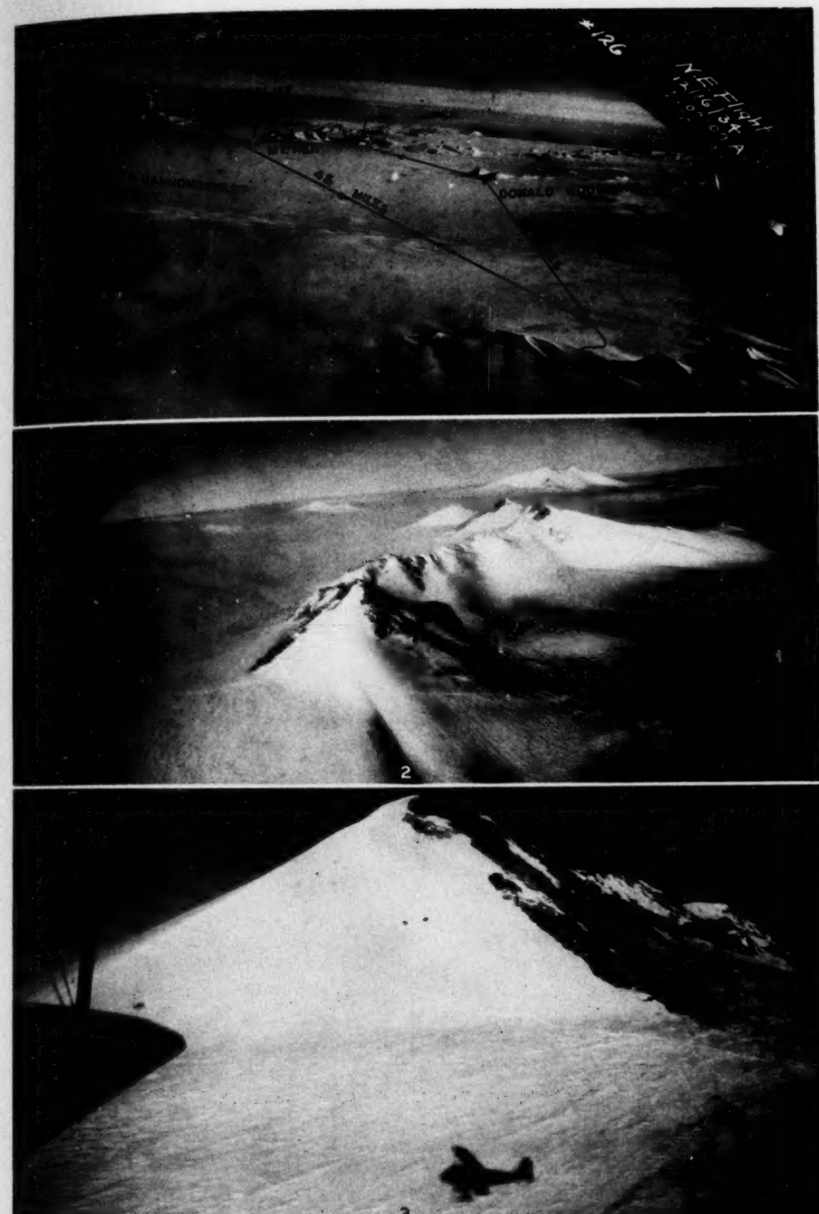
Explanation of Plate

PLATE 32

Fig. 1. General view of Edsel Ford Ranges of northwestern Marie Byrd Land as seen in an aerial photograph taken above northeastern exposures of Haines Mts., showing route of Sledging Party.

Fig. 2. Mt. Helen Washington lying on the southern side of King Edward VII Land, as seen from the air. A rookery of snowy petrel was found on the peak in the foreground, and all plant specimens were taken from this area.

Fig. 3. Mt. Helen Washington. A closer view of the southernmost peak on which the snowy petrel rookery was found. A line of lower limit of plant growth is visible. Lack of growth below this line is probably due to recent recession of ice, and concentrated plant growth just above it is probably due to the greater supply of moisture trickling down the mountain side.



SECOND BYRD ANTARCTIC EXPEDITION

Explanation of Plate

PLATE 33

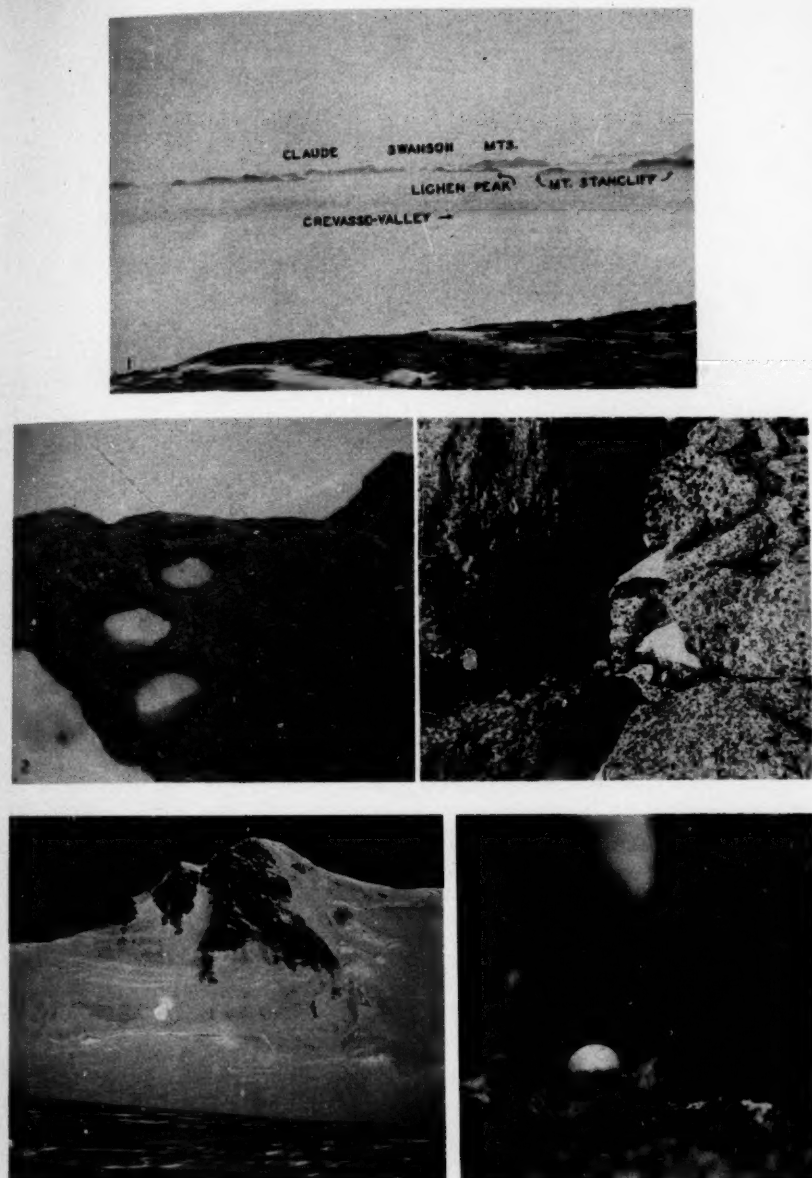
Fig. 1. Claude Swanson Mts. A view of numerous peaks lying 25 miles south of Chester Mts., of which only the two most northern ones have been visited.

Fig. 2. Mt. Grace McKinley. Strange depressions probably formed by wind erosion in weak portions of coarse-grained leucogranite are catchment basins for snow which melts to form a water supply for *Alectoria antarctica*.

Fig. 3. Mt. Rea-Cooper. Plant life decorates rocks as raisins in a pudding. Slow melting of snow in such depressions is a water supply during growing periods.

Fig. 4. Haines Mts. A northeastern exposure showing location of outcrops too perilous for collecting specimens.

Fig. 5. Mt. Helen Washington. A snowy petrel egg lying in sheltered retreat between rocks. Guano enriches the growth of lichens which may be seen on weathered coarse-grained granite. (Photo of O. D. Stancliff.)



SECOND BYRD ANTARCTIC EXPEDITION

Explanation of Plate

PLATE 34

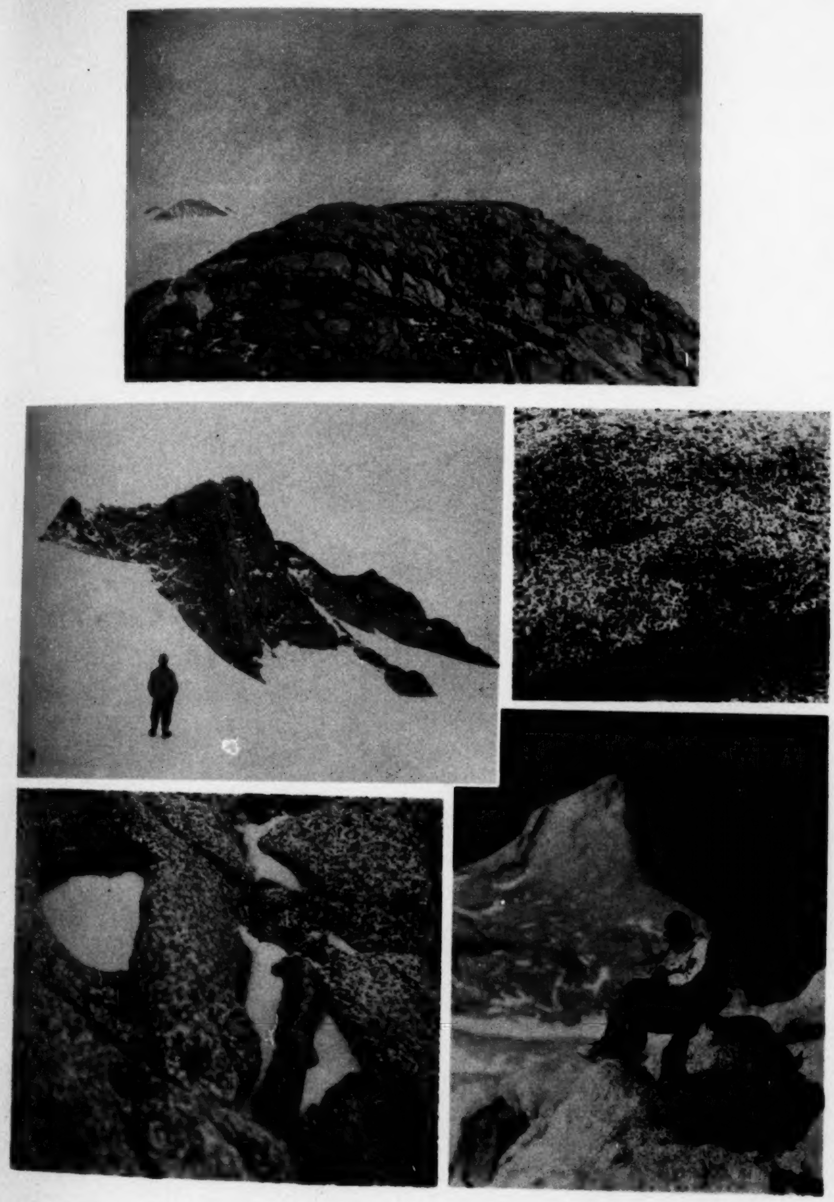
Fig. 1. Mt. Rea-Cooper. View facing southwest, with Mt. Donald Woodward to the left and Haines Mts. in central distance. In foreground is a knob of igneous rock with stoped inclusions of schists of sedimentary origin.

Fig. 2. Mt. Grace McKinley. View taken about a mile to the northeast. North face of mountain is sheer cliff, while south slope is more gentle and snow covered. Only approachable area for collection is along precarious upper edge of cliff.

Fig. 3. Mt. Grace McKinley. Small isolated patches of *Usnea* and *Alectoria* growing on coarse leucogranite.

Fig. 4. Mt. Grace McKinley. Small structural hollows form catchment basins for snow which melts slowly and forms the water supply for plant growth. Plants are mostly *Alectoria*.

Fig. 5. Mt. Rea-Cooper. F. Alton Wade, geologist, sitting on one of the boulders of the talus slope on the west side of Mt. Cooper. Note small isolated patches of plant life on the rocks, a common characteristic. Such plants receive little moisture and are seldom large. (Photo of O. D. Stancliff.)



SECOND BYRD ANTARCTIC EXPEDITION

EXPLANATION OF PLATE

PLATE 35

Fig. 1. Mt. Stancliff, seen looking southwest from Chester Mts. Mt. Stancliff is encircled by other mountains and enjoys the richest flora, amounting to nearly 50 species of lichens and mosses.

Fig. 2. Skua Gull Peak, with the loftier parts of Mt. Stancliff rising in the background to the east. The pond nestled in the top of this peak remains unfrozen during the summer and is abundant in microscopic life. Skua gulls visit it periodically, probably as a resting place. Mosses and lichens are abundant all about this sheltered pond. Note the growths on the rock in the foreground.

Fig. 3. Mt. Rea-Cooper. Talus slope which supports most of the plant life found on this mountain. About two miles away is the sheerest cliff of Mt. Rea, nicknamed "Billboard" because of its appearance.

Fig. 4. Skua Gull Peak. A crest view showing a drier area almost free of snow in early summer. Plant life here becomes sparser due to lack of available moisture, but is common in cracks. The flat spreading *Lecanora* may be seen on the vertical faces in the left foreground.

SECOND BYRD ANTARCTIC EXPEDITION

EXPLANATION OF PLATE

PLATE 36

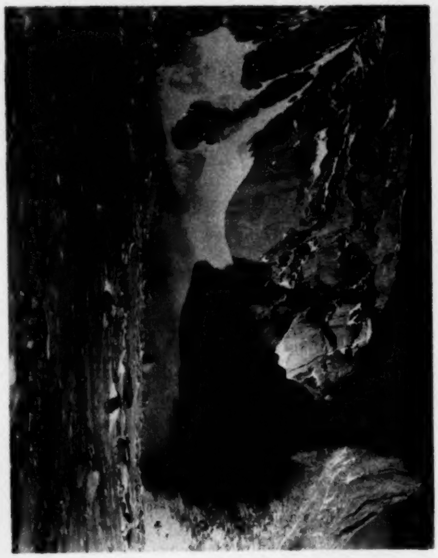
Fig. 1. Mt. Rea-Cooper. General aspect of the sheer cliffs at the northern end of Mt. Cooper, several of which were nearly 1000 ft. high. Morainic material and talus were best collecting grounds. This picture was taken nearly a mile to the west of the mountain. Note the stoped blocks of shists in the granite rock mass. (Photo of O. D. Stancliff.)

Fig. 2. Skua Gull Peak. An area of typical abundant growth of plants on dark metamorphic sediments. Note the flat sloping rock surface which permits a trickle of water from snow above, also the accumulation of plant growth in cracks and hollows. The broad patch in the center toward which the forcep handle is pointing is the conspicuous red branching *Gasparrinia Siplei*.

Fig. 3. Mt. Rea-Cooper. General appearance of lichen growths grouped together on coarse leucogranite. Note the plants on the small rocks. As many as ten species were found on a single stone. (Photo of O. D. Stancliff.)

Fig. 4. Scudder Mt. near Organ Pipes, Queen Maud Range. Most southerly plant life so far collected, 237 nautical miles from the South Pole. (Photo of R. S. Russell, Jr.)

Fig. 5. Mt. Donald Woodward. An encampment of the Marie Byrd Land Sledging Party about a quarter of a mile from the mountain. A wind moat lies between camp and base of the mountain. Note the blackness of metamorphic sedimentary schists.



SECOND BYRD ANTARCTIC EXPEDITION

Explanation of Plate

PLATE 37

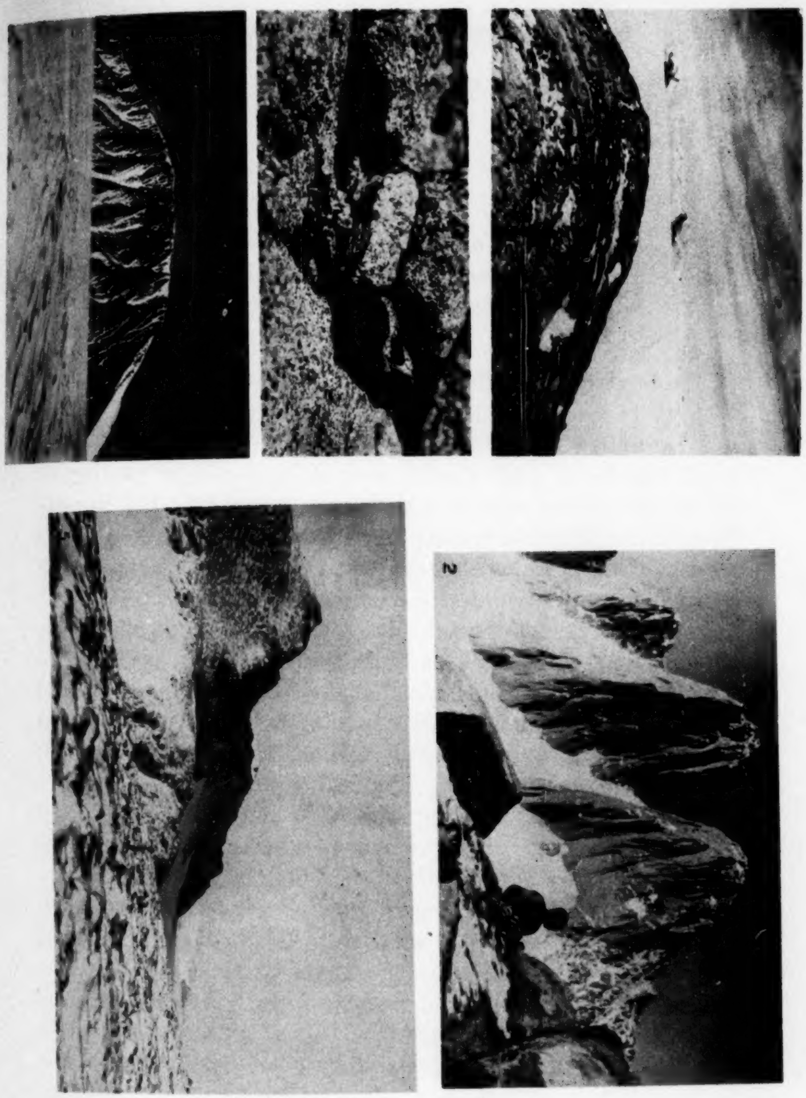
Fig. 1. Mt. Corey, looking north toward volcano and Raymond Fosdick Mts. Dark rocks to left are remnants of the cone, and higher peaks in background are granites and gneisses. No plants found at that point. In the foreground is an ice-polished dome of Mt. Corey which supports sparse vegetation.

Fig. 2. Queen Maud Mts. View of Organ Pipes as seen from Scudder Mt. where most southerly lichens were collected. In front, Richard S. Russell, Jr., one of the members of Queen Maud Geological Party.

Fig. 3. Mt. Rea. Moss clumps and lichens grouped along a miniature drainage line.

Fig. 4. Mt. Donald Woodward. Appearance of north face of mountain from about a mile away.

Fig. 5. Chester Mts. Typical rocky surface which supported moderate growths of mosses and lichens. This is southeast exposure with Raymond Fosdick Mts. to northeast.



SECOND BYRD ANTARCTIC EXPEDITION

II. Lichens and Lichen Parasites

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Through the kindness of Mr. Paul A. Siple, Biologist of the Second Byrd Antarctic Expedition, we have had an opportunity to study his large and interesting collection of the lichens and lichen parasites from Marie Byrd Land and King Edward VII Land and a small but representative collection by the geological party from the Queen Maud Mountains of South Victoria Land. The most complete set of plants has been deposited in the herbarium of the Missouri Botanical Garden and duplicates distributed to the larger herbaria. We also wish to express our appreciation to Professor N. Svedelius of the Botaniska Institution, Upsala, and to Professors Jens Holmboe and Bernt Lynge of the Botaniska Museet, Oslo, for the loan of material of the Borchgrevink Expedition to South Victoria Land for comparison with our material; also to Professors R. B. Wylie and G. W. Martin, who placed the facilities of the botany department of the University of Iowa at the disposal of the junior author for a portion of the work; and finally we are grateful to the Science Research Fund of Washington University for financial assistance in this study. The junior author also desires to make special acknowledgment of her indebtedness to the late Professor R. P. Baker of the University of Iowa, both for the initial suggestion to study this collection and the inspiration of his enthusiasm for all scientific advance.

Studies of the Antarctic flora are usually limited to plants occurring south of 60° rather than of the Antarctic Circle, in order to include the groups of islands commonly known as the Antarctic or Graham Land Archipelago. This somewhat

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arbitrary limit excludes South Georgia and the South Sandwich groups, whose floras are intermediate between Tierra del Fuego and the Falkland Islands to the north and the Graham Land Archipelago to the south. It also excludes Macquarie Island, the southernmost of the islands between New Zealand and South Victoria Land, and Kerguelen Land which is nearest to Kaiser Wilhelm II Land.

After the collections of Joseph Dalton Hooker, on the voyage of the Erebus and Terror (1839–1843) from Cockburn Island in the Graham Land Archipelago, little information was available until the beginning of the twentieth century. Since then our knowledge has increased very rapidly, as may be seen in the accompanying table. The number of species given is only approximate, as it is very difficult to evaluate the synonymy from lists of species without descriptions of the Antarctic plants. For some of the expeditions we may have overlooked publication of the results or specimens may not have been secured, but the table does give a rough comparison of results.

TECHNIQUE

With few exceptions most of the specimens were brought back from Antarctica in a dried condition. The larger ones were placed in a moist chamber and thoroughly softened before they were killed in formol-acetic-alcohol. Small saxicolous species were moistened *in situ* with a drop of 95 per cent alcohol followed by a drop of water, then placed in the killing solution. Specimens fixed at the time of collection were preserved in 4 per cent formalin or 70 per cent alcohol. Following fixation all material was dehydrated by a butyl alcohol series according to Zirkle ('30). Usually the material was allowed to remain in the paraffin oven about 72 hours previous to imbedding. After imbedding, the blocks were trimmed and left to soak in water for 48 hours, then sectioned. Lichens, usually thought to be difficult to cut in paraffin, are easily handled with such treatment and give good results. Serial sections were cut at thicknesses of 15, 10 and 5 μ, 10 μ apparently being most satisfactory. Practically all the slides were stained with Haiden-

SUMMARY OF ANTARCTIC COLLECTIONS

Dates	Leader	Ships	Collector	Author Bot. Rept.	Herb.	Total sp.	New to Antarctic	New sp.	Region Explored
1839–43	Ross	Erebus Terror	Hooker f.	Hooker f. '45 Hooker & Taylor '44	Kew Boston	9	9	3	Cockburn I. Graham Land
1897–99	Gerlache de Gommery	Belgica	Racovitsa	Vainio '03	Turku	55	51	29	Graham Land
1898–00	Borchgrevink	Southern Cross	Hanson, et al.	Fries '02 Blackman '02	Oslo	4 4	3 1	1 0	S. Victoria Land
1901–03	Drygalski	Gauss		Zahlbruckner '06		3	0	0	K. Wilhelm II Land
1901–03	Nordenskjöld	Antarctic	Skottsberg	Darbishire '12	Stockholm	47	19	9	Graham Land
1901–04	Scott	Discovery		Darbishire '10	Brit. Mus.	24	12	5	S. Victoria Land
1902–04	Bruce	Scotia	Rudmose-Brown	Darbishire '05		11	6	0	Graham Land
1903–05	Charcot	Français	Charcot Turquet	Hue '08	Paris	16	6	4	Graham Land
1907–09	Shackleton	Nimrod	Priestley	Darbishire '23	Brit. Mus.	15	1	1	S. Victoria Land
1908–10	Charcot	Pourquoi Pas	Gain Liouville	Hue '15	Paris	112	93	89	Graham Land
1910–11	Amundsen	Fram	Prestrud	Unpublished	Oslo	..	..	..	S. Victoria Land
1910–11	Scott	Terra Nova		Darbishire '23	Brit. Mus.	17	8	8	S. Victoria Land
1911–14	Mawson	Aurora		Cheel	Adelaide				S. Victoria Land
1914–16	Shackleton	Endurance		Darbishire '23	Brit. Mus.				Weddell Sea
1928–30	Byrd	E. Bolling City of N. Y.	Gould?		U. Mich.?				K. Edward VII Land S. Victoria Land
1933–35	Byrd	J. Ruppert Bear of Oakland	Siple Blackburn	Dodge & Baker '38	Mo. Bot. Gard.	89	84	84	Marie Byrd Land K. Edward VII Land S. Victoria Land

hain's iron-alum haematoxylin with a counter stain of phloxine (a 1 per cent solution in 95 per cent alcohol). Such slides served as the basis of the morphological studies.

For the series showing the ascus development from young to mature stages, small apothecia or portions of larger apothecia were moistened with a weak solution of potassium hydroxide, washed in water, and mounted in lacto-phenol to which was added 10–20 drops of 1 per cent acid fuchsin and 1 drop of cotton blue according to Maneval ('36). The mounts were crushed slightly to spread out the thecial elements. Nuclei often show clearly after such treatment, but all nuclear details illustrated were either taken from or substantiated by similar details found in the permanent slides. All habit sketches were drawn with the aid of a binocular dissecting microscope at suitable magnifications. An Abbé camera lucida was used for all other drawings.

Measurements expressed in millimeters were made by means of a micrometer disc inserted in the 17× ocular of a binocular dissection microscope calibrated for the various objectives. Measurements expressed in microns were based on a range of sizes secured from both whole mounts and permanent slides. In many instances, scarcity of material prevented more than a single sample of each mount, thereby limiting ranges to two or even one apothecium. Additional collections therefore might easily modify the sizes as here recorded. Figures given in parentheses indicate a single exception. Measurements for the algae are for single cells unless a colony is specified.

Measurements of the ascus were taken from the longest and broadest points of each. In illustrating the developmental series the youngest stage observed, the stage at which the gelified sheath appears, a stage of the developing spores, and the mature ascus were usually figured. All asci and spores were drawn at a common magnification. Throughout the material, the asci show a protective gelified sheath varying from thick to thin as shown by pl. 44, fig. 99; pl. 46, fig. 136; pl. 53, figs. 262, 267. Such a sheath apparently is not of rare occurrence in lichens of the temperate regions but seems to be rarely recorded (cf. Nannfeldt, '32, p. 68). It appears to be

somewhat thicker than those we have observed from the temperate zone. Although the ascus is a stable organ, a comparison of forms makes it clear that more than agreement of overall dimensions is necessary to establish the identity of asci. Ascospore sizes are given for the largest to the smallest noted.

MORPHOLOGY

The structural diagrams are figured on too small a scale to show individual cells, and consequently the types of tissue composing cortex and medulla are diagrammatic and standardized. Such figures are augmented by details of distinctive tissues on an enlarged scale. The terminology has been based on that of Hue as given in Smith ('21).

Cortex

Intricate, not clearly represented in our species.

Fastigiate, e. g. in *Lecanora Siplei* (pl. 47, fig. 151) and *Buellia floccosa* (pl. 57, fig. 334).

Decomposed, not common but found in *Protoblastenia aurea* (pl. 52, fig. 230).

Pseudoparenchymatous (plectenchymatous), the most common type of cortex in these lichens, varying from a very compact tissue to occasional scattered cells, the latter usually large and fuscous, e. g. *Lecidea cancriformis* (pl. 41, fig. 48) and *Polycauliona sparsa* (pl. 54, fig. 281) for the compact types, and *Umbilicaria rugosa* (pl. 44, fig. 104) and *Buellia alboradians* (pl. 56, fig. 322) for the loose, scattered types.

Fibrous, most commonly found in the lower cortex as in *Parmelia Coreyi* (pl. 50, fig. 202) and *P. griseola* (pl. 50, fig. 206) but sometimes found in the upper cortex as in *Lecidea Siplei* (pl. 39, fig. 25).

Medulla

Felted, the most frequent type ranging from very loose and arachnoid to more or less reticulate networks, e. g. *Candelariella albovirens* (pl. 49, fig. 180a) and *Protoblastenia flava* (pl. 52, fig. 228).

Cretaceous or tartareous, not found in our species.

Cellular, e. g. *Candelariella chrysea* (pl. 49, fig. 182).

LOWER CORTEX

Repetition of the upper cortex, common when a continuous cortex is present.

Close parallel hyphae, rare, sometimes fibrous as in *Parmelia* sect. *Physcioideae* (pl. 50, figs. 202 and 206) or vertical as in *Buellia dendritica* (pl. 59, fig. 362).

Completely lacking, the usual case in crustose lichens, e. g. *Lecidea capsulata* (pl. 38, fig. 12b), *Sarcogyne grisea* (pl. 46, fig. 133), and *Buellia flavoplana* (pl. 55, fig. 297).

Only Chlorophyceae have been found as symbionts, although the Myxophyceae are represented as free-living algae growing in patches on rocks and thalli of lichens and as endogenous cephalodia in a few species. Two species of Collemaceae have been reported from Antarctica: a very depauperate *Collema crispum?* by Hooker from Cockburn Island, and *Leptogium puberulum* by Hue from King George Island in the South Shetlands. In the austral family Stictaceae where species with blue-green symbionts are abundant in Tierra del Fuego and the Falkland Islands, only *Sticta endochrysea* (with protococcoid symbiont) has been found at Cape van Beneden, Danco Land, 64°41′ S. As Forssell ('85) and Hue ('11) have pointed out, the lichens with protococcoid symbionts seem to be a much older group. Hence it is possible that we are dealing with a very ancient flora which has survived in the Antarctic and that the more recent groups with blue-green symbionts have not been able to penetrate. In Marie Byrd Land and probably in South Victoria Land, the species have been isolated so long that endemic species have developed but few new genera. In the Arctic, the Collemaceae reach northern latitudes corresponding to the southern latitude of Marie Byrd Land and are abundant in genera and species even in East Greenland where environmental conditions seem to be similar to those of Graham Land and Marie Byrd Land.

Usually the algal symbiont is much less abundant than in species of the same genera from more temperate climates. In many species the algal cells are more or less scattered throughout the medulla rather than organized in a definite layer below

the cortex, as is the case with temperate species in the same genera. In some cases the assimilative portion of the thallus is confined to the cracks between the crystals and scarcely reaches the outer surface of the rock. In the *Buelliaceae,* the differentiation of the thallus into assimilative areoles and non-assimilative portion (referred to as hypothallus or prothallus by some authors) has been carried to extremes. The apothecia are often borne on the non-assimilative portion which is connected by long strands to the assimilative areolae.

The whole thallus in proportion to the apothecia is greatly reduced, compared with that of temperate species in the same genus. In foliose genera *Umbilicaria* is reduced to small, often densely folded rosettes in all but the most sheltered positions. *Parmelia* is reduced to small umbilicarioid *(P. (Omphalodium) quarta* Darb.) or physcioid thalli adnate to rocks or growing among dense tufts of mosses, evidently as a reaction to high wind velocities. *Pannoparmelia* suggests a very depauperate *Pannaria.* Even fruticose genera have much shorter and more delicate thalli. *Alectoria antarctica* is prostrate and more or less appressed to the substrate, becoming more erect in sheltered places but at most is only a few millimeters tall. *Usnea* reaches only a few centimeters, as compared with several meters in the cooler portions of the temperate zone.

Asexual reproduction by fragmentation is rather rare. Isidia occur in *Candelariella chrysea.* Only *Parmelia variolosa* and *Usnea* are sorediate, and even in these the small powdery patches look suspiciously like attempts at regeneration following injury by mites or other arthropods. A few bulbils were noted. Spermogonia have been rarely seen, in contrast to the large number reported by Hue from Graham Land Archipelago. Very few species lacked apothecia.

Imperfect fungi, while limited in species, are common. Often large groups of fruiting lichens and mosses were well covered, apparently parasitized. Rocks and pebbles often showed abundant hyphal patches. Even the smallest pebbles only 2–3 mm. in diameter were at times covered by fungous hyphae. *Hormiscium* sp. was usually the fungus thus observed (pl. 62,

fig. 407). In several cases, prepared slides revealed extensive patches of bacteria limited to the basal regions of the lichen among the material of the substrate (pl. 39, fig. 18). While no attempts have been made to cultivate these bacteria, we are reminded of the interesting observations of Cengia-Sambo ('23, '26), in which the nitrogen-fixing *Azotobacter* was reported growing with *Nostoc* in the thalli of various species of *Collema*. Sometimes the large dark areas covering mosses proved to be species of *Nostoc*, *Rivularia*, and *Scytonema*.

A dead skua gull, placed in a box in Antarctica, was considered to be relatively free from secondary infection, since it was unopened until it reached this laboratory. Portions of the bird, partially decomposed, were placed in sterile moist chambers at room temperature and at 9–10° C. in the refrigerator in an effort to determine what fungi were present. *Scopulariopsis brevicaulis* (Sacc.) Bain., a common organism in fingernails and other substances containing keratin, developed abundantly in all cultures (pl. 62, figs., 404, 405). Species of *Botrytis* (pl. 62, fig. 406) and *Penicillium* also developed abundantly.

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* Not seen.

Verrucariaceae

Thallus crustose, epi- or endophloedal or more frequently saxicolous or terricolous, ecorticate; algae *Protococcus,* more rarely *Palmella* in *Staurothele* and *Thelenidia,* penetrating the perithecium which is simple, erect, sessile or with the base immersed, wall carbonaceous, entire or dimidiate, ostiole more or less prominent with a shield in *Aspidothelium* and *Aspidopyrenium;* asci mostly 8-spored, many-spored in *Trimmatothele;* paraphyses early gelified and evanescent in one tribe, persistent in the other; ascospores variable in color and septation.

Only *Verrucaria* (spores simple) and *Thelidium* (spores 2–4-celled) have been reported from the Antarctic. Eight species of the former from the Antarctic Archipelago and two

(perhaps three) species of the latter are here reported from Marie Byrd Land.

THELIDIUM

THELIDIUM Massalongo, Framm. Lich. 15. 1855.

Phragmothele Clements, Gen. Fung. 39. 1909.

The type species was not designated. Of the four species originally placed here, Clements & Shear, Gen. Fung. 288. 1931, chose *T. amylaceum* Mass. *Phragmothele* was based on *P. papulare* (Fr.) Clem.

Thallus crustose, simple, ecorticate, poorly developed and often with the perithecia sessile on the crustose thalli of other lichens; algae *Protococcus;* perithecia simple, horny, carbonaceous, partly immersed or sessile; paraphyses early gelified and evanescent; asci saccate, 8-spored; ascospores ellipsoid or ovoid, hyaline or dark, 2–4-celled, commonly with a large oil droplet.

Two of our Antarctic species agree with the generic descriptions of *Thelidium,* except as to the color of the spores which are dark and the cells often of unequal size. While these differences may warrant the creation of a new genus, we prefer to leave these species in *Thelidium,* as *Verrucaria, Polyblastia,* and *Staurothele* also contain both colored and hyaline spores.

THELIDIUM **inaequale** Dodge & Baker, sp. nov.

Pl. 38, figs. 1–5.

Type: Marie Byrd Land, Edsel Ford Range, Mt. Donald Woodward, *P. Siple, F. A. Wade, S. Corey & O. D. Stancliff DW-5.*

Areolae assimilantes minutae, granulares, gelifactae, cremeae, evanescentes; algis protococcoideis hyphisque paucis.

Perithecia 90–170 × 90–145 μ, abundantia, irregulariter elongata vel hemispherica, sessilia sed nonnumquam subtus attenuata, appressa, saxicola, sparsa vel gregaria, nigra, gelifacta madefacta, pseudoparenchymatica, cellulis pachydermaticis; hypothecium paraphysesque non visa; asci 30–38 × 21–23 μ, irregulares, saccati, e basi orientes; sporae octonae, 10–13 × 5–7 μ, uniseptatae, obtusae, constrictae, una ex cellulis majore quam altera, obscurae.

Assimilative areolae microscopic, rather gelatinous, granular, cream-colored, consisting only of algae abundant although

small, and occasional hyphae, probably evanescent as the granules are rare on portions of the rock where the perithecia are abundant.

Perithecia 90–170 × 90–145 μ, distributed over areas of several square centimeters, abundant, sessile but sometimes more or less basally attenuated, closely attached to rocks, scattered or in clusters but never in very close contact, black, dull, rather gelified when moist, of thick-walled pseudoparenchymatous cells; hypothecium not extensive; asci apparently rising from the center of the base; paraphyses not seen; asci 30–38 × 21–23 μ, 8-spored, very irregular, saccate without a sheath or with a very thin one; ascospores 10–13 × 5–7 μ, 2-celled, blunt, slightly to much constricted at the septum, one cell frequently larger than the other, dark.

On biotite-sericite and sericite-orthoclase schist.

MARIE BYRD LAND: Edsel Ford Range, Mt. Donald Woodward, *P. Siple, F. A. Wade, S. Corey & O. D. Stancliff DW-5*; Lichen Peak, *P. Siple & S. Corey 73-10.*

THELIDIUM **Caloplacae** Dodge & Baker, sp. nov.

Pl. 38, figs. 6–10.

Type: Marie Byrd Land, Edsel Ford Range, Mt. Donald Woodward, *P. Siple, F. A. Wade, S. Corey & O. D. Stancliff DW-4.*

Perithecia sessilia vel basi subimmersa, ad 150 μ diametro, subspherica, nigra, carbonacea, laevia (sub lente irregularia); ostiola non bene evoluta, murus 20–50 μ crassitudine; cortex 10–40 μ, cellulis magnis, pachydermaticis, obscure brunneis vel nigris, media parte 10–15 μ crassitudine, pseudoparenchymatica, leptodermatica, strato interiore cellulis parvis numerosis ad ostiolam periphyses gignentibus; ostiola parva, centrica; thecium basale, paraphyses desunt; asci 42–50 × 15–19 μ, elongato-clavati, vaginati, polyspori; sporae 6.5–7 × 3–4 μ, bicellulares, brunneae.

Perithecia sessile on the host, thallus or base slightly immersed, up to 150 μ in diameter, subspherical, black, carbonaceous, macroscopically appearing smooth, microscopically somewhat irregular, ostiole poorly defined, small, central, wall 20–50 μ thick; cortex 10–40 μ thick, of large thick-walled cells, dark brown to black, middle layer 10–15 μ thick, of lighter-colored, thin-walled pseudoparenchyma, innermost layer lining the perithecial cavity, of numerous small cells, better de-

veloped near the ostiole where they fray out into more or less periphysis-like structures; thecium basal, paraphyses absent; asci 42–50 × 15–19 μ, elongate-clavate with a prominent sheath, many-spored; spores 6.5–7 × 3–4 μ, 2-celled, not constricted at the septum, more or less pointed to blunt, brown.

Parasitic on the thalli of *Gasparrinia Siplei* and *Kuttlingeria rufa,* growing over biotite sericite and orthoclase-sericite-siderite schist.

The systematic position of this species is uncertain, as it is not clear whether the algae in the vicinity of the perithecia belong to the parasite or to the host. If the latter view is correct, it may belong in ***Amphisphaeria*** Ces. & Ntrs.

Marie Byrd Land: Edsel Ford Range, Mt. Donald Woodward, *P. Siple, F. A. Wade, S. Corey & O. D. Stancliff DW-2, DW-4,* type; Skua Gull Peak, *P. Siple & S. Corey 72W-6.*

Thelidium **parvum** Dodge & Baker, sp. nov.

Pl. 62, figs. 393–395.

Type: Marie Byrd Land, Edsel Ford Range, Skua Gull Peak, *P. Siple & S. Corey 72W-4.*

Thallus minimus, hyphis brunneis, 2–4 μ diametro; algis *Scytonema* et *Protococcus,* cellulis ad 12 μ diametro.

Perithecia ad 50 × 55 μ, subsphaerica, parva, obscure brunnea, ostiolata, muro subaspero, 7–10 μ crassitudine, cellulis compactis, obscuris, pachydermaticis, isodiametricis; paraphyses desunt, deliquescentes; asci 28–31 × 10–12 μ, subbasales, elongati, subclavati, evaginati; ascosporae octonae, 7.5–9 × 3–3.5 μ, uniseptatae, cellula una majore obtusoque, altera minora, subacuta, hyalinae.

Non-assimilative parts lacking, assimilative thallus extremely reduced, hyphae slightly brownish, 2–4 μ in diameter, surrounding miscellaneous algae principally *Scytonema* and *Protococcus* with cells up to 12 μ in diameter. Sometimes a few colonies of bacteria are present.

Perithecia up to 50 × 55 μ, subspherical, small, very inconspicuous dark brown, ostiolate above, wall somewhat rough, 7–10 μ thick, of compact dark cells, thick-walled, isodiametric; no paraphyses seen, probably deliquescing early, leaving gelified slimy strands among the asci which are 28–31 × 10–12 μ, more or less limited to the basal region, elongate, somewhat

clavate, 8-spored, without a gelified sheath; ascospores 7.5–9 × 3–3.5 μ, 2-celled, not constricted at the septum, one cell larger and blunt at the end, the other smaller, more pointed, each cell uninucleate, hyaline.

The symbiotic relations and hence the systematic position of this species are puzzling. The fungous hyphae seem to be involving two groups of algae, either as parasites or symbionts and growing over the thallus of *Parmelia variolosa,* on sandy loam from leucogranite. As in *T. Caloplacae,* we have preferred to leave this species with the lichens until more is learned of its life history.

MARIE BYRD LAND: Edsel Ford Range, Skua Gull Peak, *P. Siple & S. Corey 72W-4.*

LECIDEACEAE

Thallus crustose, simple or with effigurate margins, continuous, areolate to squamulose (in *Lecidea* sect. *Psora)* and dwarf-fruticose (in *Sphaerophoropsis),* attached to the substrate by the hyphae of the hypothallus or of the medulla without differentiated rhizinae, often decorticate, ecorticate, or with an incomplete cortex of fasciculate thick-walled hyphae, never pseudoparenchymatous; algal layer of *Protococcus* cells, rarely producing many cells in a colony before the wall disappears, giving somewhat the appearance of a *Gloeocapsa;* medulla loosely woven with basal layer not differentiated or suggesting the structure of the upper cortex. Apothecia round, sessile, occasionally immersed or with a very short stalk, with parathecium hyaline or carbonaceous, not surrounded by an amphithecium nor including medullar tissue; hypothecium hyaline to carbonaceous; paraphyses usually simple, but branched in most of our Antarctic species, either free or imbedded in a gel; asci usually 8-spored, only exceptionally with fewer than 8 in *Mycoblastus* and *Megalospora,* or more (16–32 in a few species of *Lecidea* and *Bacidia);* ascospores usually hyaline, rarely brown *(Rhizocarpon),* of a variable number of cells, with or without a gelified sheath. Spermagonia immersed, spermatia elongate-ellipsoidal to cylindrical.

KEY TO ANTARCTIC GENERA

Spores unicellular...*Lecidea*
Spores 2-celled, under 30 μ long.
  Spores without a conspicuous sheath, long, hyaline...................*Catillaria*
  Spores with a conspicuous sheath, hyaline or brown.................*Catocarpon*
Spores several-celled, usually finally muriform, with a conspicuous sheath......
....*Rhizocarpon*

LECIDEA

LECIDEA Acharius, Meth. Lich. 32. 1803.

No type species was designated.

Thallus crustose, simple, continuous, areolate, verrucose or squamulose (in sect. *Psora),* attached to the substrate by hyphae of the hypothallus or of the medulla, without true rhizinae, ecorticate or with a thin cortex, sometimes sorediose, very rarely with true soralia or cephalodia; algae *Protococcus.* Apothecia round or angled by mutual pressure, exceptionally slightly elongate, immersed, sessile or very short-stalked, with hyaline, colored, or black parathecium of closely woven hyphae, epithecium bright or black; hypothecium hyaline, colored or carbonaceous; paraphyses unbranched in most temperate species but often branched in the Antarctic ones, with more or less thickened and capitate tips, free or imbedded in a gel; asci usually 8-, rarely 16-, spored; ascospores hyaline, unicellular, small, spherical, ovoid, ellipsoid or allantoid, straight or somewhat curved with a thin wall (or thickened with more or less of a sheath in the Antarctic species). Spermogonia immersed with a dark mouth, spherical, spermatia short-cylindric to filiform, straight or curved.

This large genus of the cold and temperate zones is usually divided into three sections often recognized as genera: *Eulecidea,* thallus simple, parathecium carbonaceous; hypothecium either carbonaceous or hyaline, of the colder regions; *Biatora,* thallus simple, parathecium and hypothecium never carbonaceous, varying from hyaline to colored, of the temperate regions; and *Psora,* thallus squamose, margin effigurate, parathecium either colored or black, mostly in the warmer, semiarid regions. Of these, two species of *Psora* have

been reported from the Antarctic Archipelago, five species of *Biatora* from Louis Philippe and Graham Lands and twelve species of *Eulecidea,* of which two have been found in South Victoria Land, the rest from the Antarctic Archipelago.

KEY TO ANTARCTIC SPECIES

Thallus not effigurate, uniform.
- Apothecia bright-colored, not carbonaceous.......... BIATORA
  - Thallus flesh-color.......... *L. lavae*
  - Thallus white.......... *L. poeciloderma*
  - Thallus yellowish, granulose.......... *L. theiochroa*
  - Thallus pale straw-color, areolate.
    - Margin of thallus black.......... *L. monocarpa*
    - Margin of thallus concolorous.......... *L. acervuligera*
- Apothecia black, carbonaceous.......... EULECIDEA
  - Thallus deep grayish, brown or fuscous.
    - Spores less than 10 μ; hypothecium hyaline; thallus fusco-rufous.......... *L. brunneoatra*
    - Spores more than 10 μ.
      - Apothecia 1 mm. or more.
        - Thallus thick, hypothecium black.......... *L. atrobrunnea*
        - Thallus thin, poorly developed.......... *L. fuscoatra*
      - Apothecia less than 1 mm.; thallus 0.4–0.5 mm.
        - Thallus grayish.......... *L. cinericia*
        - Thallus brownish.......... *L. rufonigerrima*
  - Thallus citrine drab to pale olive buff.......... *L. Blackburni*
  - Thallus white to pale yellowish, sometimes stained ferruginous when growing over ferriferous rocks.
    - Apothecia over 2 mm. in diameter.......... *L. auriculata*
    - Apothecia up to 1.5 mm. in diameter.......... *L. cancriformis*
    - Apothecia 1 mm. or less in diameter.
      - Hypothecium dark fuscous to brown.
        - Spores 10–16 × 5–8 μ; hypothecium 100–150 μ.
          - Cortex not differentiated; apothecia 0.315 mm.; thecium 60 μ; paraphyses 0.5–1.5 μ, tips 2 μ.......... *L. ecorticata*
          - Cortex 30–60 μ; apothecia 0.6–1.0 mm.
            - Thecium 100–120 μ; paraphyses 5–6 μ, tips not thickened.......... *L. cremoricolor*
            - Thecium 140–160 μ; paraphyses 3 μ, tips furcate.......... *L. sciatrapha*
        - Spores 7.5–10 μ long; epithecium K green.
          - Spores 2–3 μ in diameter; thecium 30–40 μ; asci short-clavate, base not attenuate, 24–28 (–32) × 12.5–14 μ.......... *L. Coreyi*
          - Spores 5–6 μ in diameter; thecium 60 μ.......... *L. rupicida*
        - Spores 6–8.5 μ long; epithecium K green.
          - Spores 1.7–2.5 μ in diameter.

Asci 25–42 μ, inflated above, attenuate below; hypothecium 100 μ with long strands penetrating the medulla..*L. cancriformis*
Asci (37–) 52–60 μ, not inflated; hypothecium 60–70 μ, not penetrating the medulla.......................*L. Blackburni*
Spores 3.5–5 μ in diameter; asci 23–31 × 6–9 μ.............*L. Painei*
Hypothecium hyaline.
Spores 10–20 μ long.
Spores 3–5 μ in diameter; asci (20–)32–40 × 12.5–16 μ; thecium 60–70 μ; epithecium K green.........................*L. Wadei*
Spores 5–8.5 μ in diameter.
Paraphyses 1.0–1.5 μ, not capitate; epithecium K–; asci 30–44 × 14–16(–20) μ..................................*L. Byrdii*
Paraphyses 0.75–1.0 μ, capitate; epithecium K green; asci (41–)48–62(–70) × 15–18 μ.........................*L. Siplei*
Paraphyses 3–4 μ, not capitate.......................*L. eburnea*
Spores 7–11 μ long.
Spores 5–6 μ in diameter; epithecium K–; thecium 55–60 μ.
Apothecia 0.3–0.5 mm.; spores 8–10 μ long.............*L. rupicida*
Apothecia 0.675 mm.; spores 10–11 μ long...............*L. Byrdii*
Spores 3–5 μ in diameter; epithecium K green.
Thecium 50–60 (–70) μ; apothecia 0.225 mm.; paraphyses 0.75–1–1.5 μ, not capitate..........................*L. capsulata*
Thecium 70 μ; apothecia 0.60 mm.; paraphyses 1.5–2.5 μ, capitate, heads 4–5 μ............................*L. Stancliffi*
Thallus effigurate; apothecia black; hypothecium hyaline..................PSORA
Thallus cupreous to dark chestnut, non-assimilative thallus slightly developed, fibrillose..*L. placodiiformis*
Thallus light yellow to light chestnut, with a broad black non-assimilative border...*L. physciella*

LECIDEA Siplei Dodge & Baker, sp. nov.

Pl. 39, figs. 22–28; pl. 63, fig. 410.

Type: Marie Byrd Land, Edsel Ford Range, Skua Gull Peak, *P. Siple & S. Corey 72W-4.*

Thallus plus minusve continuus, ad 1.5 cm. diametro, areolae ad 1.8 mm., deinde diffractae, granulosae vel verrucosae, gelifactae madefactae, albae vel griseae, in solo una cum muscis; cortex 10–30 μ crassitudine, hyphis periclinalibus, extremis emortuis gelifactis amorphisque; stratum gonidiale ad 85 μ crassitudine, cellulis singulis 10–11 μ diametro; medulla ad 450 μ crassitudine, hyphis reticulatim laxeque intertextis; stratum basale non bene evolutum, paullo densius obscuriusque.

Apothecia ad 0.9 mm. diametro, maturitate convexa, marginibus juventute inflexis, irregulariter spherica, sparsa vel gregaria, carbonacea, marginibus 10–20 μ, cellulis obscuris fastigiatis; parathecium 20–40 μ, cellulis obscuris, fastigiatis isodiametricisve, subtus tenuescens et cum cortice mergens; hypothecium 50–70 μ, hyalinum, pseudoparenchymaticum, non in lateribus tenuescens, basaliter in medullam

filamentosam cellulis tenuibus laxe implexis ad 100 μ crassitudine mergens, totam super medullam areolarum; thecium 50–100 μ altitudine; paraphyses 0.75–1.0 μ, apicibus inflatis, 1–1.5 μ, raro ramosi, graciles, septati, epithecium ad 15 μ crassitudine, carbonaceum; asci (41–)48–62(–70) × 15–20(–22) μ, elongati, graciles, clavati, conspicue vaginati; ascosporae octonae, 10–14 × 5.0–8.5 μ, hyalinae, late ellipsoideae, raro subovoideae, unicellulares.

Thallus more or less continuous over areas of a few mm. to 1.5 cm., broken up into areolae up to 1.8 mm., crustose with secondary cracks, granulose to verrucose, gelified when wet, white or grayish, on soil with mosses; cortex 10–30 μ thick, of periclinal hyphae, the outer ones dying, becoming gelified and amorphous; algal layer up to 85 μ thick, cells occurring singly, 10–11 μ in diameter; medulla up to 450 μ thick, of reticulate hyphae loosely interwoven; basal cortex scarcely differentiated, here and there slightly denser and darker.

Apothecia up to 0.9 mm. in diameter, convex at maturity, often with inrolled margins when young, irregularly spherical, sessile, scattered or gregarious, carbonaceous; exciple 10–20 μ, of dark fastigiate cells; parathecium 20–40 μ, of dark fastigiate or isodiametric cells, thinning below and merging with the thalline cortex; hypothecium 50–70 μ thick, of hyaline pseudoparenchyma, not thinning laterally, basally passing into a filamentous medulla of very fine, loosely arranged cells for about 100 μ before merging with the coarser reticulate medulla of the assimilative areolae; thecium 50–100 μ high; paraphyses 0.75–1.0 μ, expanding to 1–1.5 μ at the tips, rarely branched, fine, septate, apices delicately inflated, united into a carbonaceous layer, small bits of which often cling to the outer surfaces, heads small, gelified, not darkened, epithecium up to 15 μ thick, carbonaceous; asci (41–)48–62(–70) × 15–20(–22) μ, 8-spored, elongate, slender, clavate with a conspicuous gelified sheath; ascospores 10–14 × 5.0–8.5 μ, hyaline, broadly ellipsoid to somewhat ovoid, 1-celled.

On loose sandy soil from biotite-sericite, sericite-orthoclase schist, and orthoclase-sericite-siderite schist.

Marie Byrd Land: Edsel Ford Range, Mt. Donald Woodward, *P. Siple, F. A. Wade, S. Corey & O. D. Stancliff DW-1, DW-3;* Stancliff Mt., *P. Siple & S. Corey 72A-1;* Skua Gull Peak, *P. Siple & S. Corey 72W-4,* type; Lichen Peak, *P. Siple & S. Corey 73-3, 73-4, 73-7.*

LECIDEA **Wadei** Dodge & Baker, sp. nov. Pl. 39, figs. 18–21.
Type: Marie Byrd Land, Mt. Rea-Cooper, *P. Siple, F. A. Wade, S. Corey & O. D. Stancliff R-6.*

Thallus parvus, inconspicuus, in solo inter muscos, areolatus vel granulosus, gelifactus madefactus, albus vel pallide stramineo-flavus; cortex superior evanescens, paucis cellulis obscuris relictis, superficie thalli catervis cellularum emortuarum tecta; stratum gonidiale variabile, coloniis compactis, numerosis, sparsis; medulla ad 150 μ crassitudine, hyphis circa 1 μ diametro, reticulatim laxeque dispositis; stratum basale male evolutum, subamorphum gelifactumque cum bacteriis algisque extraneis.

Apothecia circa 0.675 mm., raro ad 0.9 mm. diametro, irregulariter hemispherica, juventute applanata, sessilia, sparsa vel gregaria, carbonacea; parathecium 20–30 μ crassitudine, paucis cellulis fastigiatis, exteris obscuris, cum epithecio mergens; hypothecium 20–30 μ, hyalinum, hyphis tenuibus, compactis, basaliter cum medulla mergens; thecium ad 60 μ altitudine; paraphyses 0.75–1.0 μ, apicibus ad 2 μ diametro, tenuissimi, vaginati, epithecium 8–10 μ crassitudine, KOH addito viridescens, obscuri; asci 32–40 × 12.5–16 μ, obtuse clavati, apicibus vaginatis; ascosporae octonae, 11–14 × 3–5 μ, elongato-ellipsoideae, juventute subsphericae, vaginatae, hyalinae, unicellulares.

Thallus scant, only a few mm. in diameter, inconspicuous, on soil among mosses, areolate to granulose, gelified when moist, white to pallid straw yellow; upper cortex poorly represented by occasional dark fastigiate cells, rarely more than one cell thick, outer surface usually decorticate, covered by extensive masses of dead cells; algae in compact groups in the upper portions of the thallus, surrounded by hyphae more closely united than in the medullar tissue, numerous; medulla up to 150 μ thick, of loosely reticulate hyphae about 1 μ in diameter; basal cortex not differentiated, but with a distinct basal zone from 40 to 300 μ thick, structure indistinct, almost amorphous, perhaps gelified, in the upper portions with a few medullar hyphae which can still be traced, abundantly packed with clumps of bacteria and a few algae.

Apothecia about 0.675 mm., rarely up to 0.9 mm. in diameter, irregularly hemispheric, flatter when young, sessile on the assimilative thallus, scattered or gregarious, carbonaceous; parathecium 20–30 μ thick, of a few fastigiate cells, darkened on the outside, merging with the epithecium; hypothecium 20–30 μ thick, hyaline, of slender compact hyphae, not thinning laterally, basally uniting with the medulla which is truly

reticulate and filamentous; thecium up to 60 μ tall; paraphyses 0.75–1.0 μ in diameter, expanding above to 2 μ, covered by a sheath but the sheath not much darkened nor expanded at the tip, very slender, septate, unbranched or branched, the whole forming a rather gelified mass; epithecium 8–10 μ, turning green with KOH, dark; asci 32–40 × 12.5–16 μ, 8-spored, bluntly clavate at maturity with a well-developed apical sheath; ascospores 11–14 × 3–5 μ, nearly spherical when young, elongate-ellipsoidal at maturity, covered with a delicate sheath which is more prominent in immature spores, hyaline, unicellular.

Among mosses on loose sandy loam from leucogranite.

MARIE BYRD LAND: Edsel Ford Range, Mt. Rea-Cooper, *P. Siple*, *F. A. Wade*, *S. Corey & O. D. Stancliff R-6.*

LECIDEA **capsulata** Dodge & Baker, sp. nov.

Pl. 38, figs. 11–17.

Type: Marie Byrd Land, Edsel Ford Range, Mt. Stancliff, *P. Siple & S. Corey 72A-2.*

Thallus sparsus in areis 1–3 cm. diametro, saxicola, floccosus vel arachnoideus, plus minusve continuus; areolae ad 0.45 mm. diametro, irregulares, albae vel "cartridge buff" aut ochraceae a saxis ferriferis tinctae; cortex deest vel paucis cellulis fastigiatis relictis; stratum gonidiale ad 50 μ crassitudine, coloniis parvis paucisque, sparsis; medulla hyphis laxe reticulatimque contexta, 1 μ diametro; stratum basale non evolutum.

Apothecia ad 0.225 mm. diametro, irregulariter circularia, applanata vel concava, marginata, juventute subcyathiformia, sessilia, sparsa, nigra, nitida; parathecium ad 40 μ crassitudine, cellulis magnis fuscis pachydermaticis, hypothecium theciumque circumdans; hypothecium ad 30 μ crassitudine, hyalinum vel subobscurum, hyphis tenuibus periclinalibus pachydermaticis; thecium ad 70 μ altitudine; paraphyses 0.75–1.5 μ diametro, septati, ramosi insuper, tenues, flexuosi, vaginati, epithecium 5–8 μ, obscurum, KOH addito virescens; asci (20–) 30–42 × 12–16 μ, breves, late clavati, vaginati; ascosporae octonae, 7–11 × 3–4.5 μ, hyalinae, ellipsoideae, vaginatae, unicellulares.

Thallus scattered over areas 1–3 cm. in diameter, on rocks, floccose to arachnoid and more or less continuous or of separate areolae scattered over the rock, individual areolae up to 0.45 mm. in diameter, irregular in shape, white to cartridge buff or stained by rust from the rocks; upper cortex evanescent except for an occasional group of fastigiate cells; algal layer up to 50 μ thick, of small and few scattered colonies; medulla of

loose reticulate hyphae about 1 μ in diameter which are slightly more compact and abundant around the algae; no basal layer differentiated.

Apothecia up to 0.225 mm. in diameter, irregularly circular, flat or concave with a margin, especially so when young, almost cyathiform, sessile on the assimilative thallus, scattered, black and shining; parathecium highly developed, up to 40 μ thick, entirely surrounding the thecium and hypothecium, of large fuscous thick-walled cells in a palisade, forming the cortex as well, basally distinct from the medulla which is more compact below the apothecium but with the cells no larger in diameter; hypothecium up to 30 μ thick, even, thinning somewhat laterally and merging into the parathecium; thecium up to 70 μ tall; paraphyses 0.75–1.5 μ in diameter, septate, branched often more than once near the tip, slender, slightly flexuous with a thin sheath, neither much expanded nor darkened at the tip, epithecium 5–8 μ, dark, turning green with KOH; asci (20–)30–42 × 12–16 μ, 8-spored, short, broadly clavate with a conspicuous gelified sheath which is distinct from an early stage; ascospores 7–11 × 3–4.5 μ, hyaline, ellipsoidal with a conspicuous gelified sheath.

The specimen from Mt. Rea-Cooper has apothecia up to 0.65 mm. but agrees microscopically and grows on leucogranite.

On biotite-sericite, sericite-orthoclase schist, quartzite, and leucogranite.

Marie Byrd Land: Edsel Ford Range, Mt. Donald Woodward, *P. Siple, F. A. Wade, S. Corey & O. D. Stancliff DW-3, DW-5*; Mt. Stancliff, *P. Siple & S. Corey 72A-1, 72A-2*, type; Lichen Peak, *P. Siple & S. Corey 73-10*; Chester Mts., *P. Siple & S. Corey 97A-3*; Mt. Rea-Cooper, *P. Siple, F. A. Wade, S. Corey & O. D. Stancliff R-7*.

Lecidea **Coreyi** Dodge & Baker, sp. nov. Pl. 40, figs. 29–34.

Type: Marie Byrd Land, Edsel Ford Range, Lichen Peak, *P. Siple & S. Corey 73-6*.

Thallus paucis mm. diametro, bene evolutus, tenax, gelifactus madefactus, irregulariter areolatus, saxicola, albidus; cortex cellulis fastigiatis, non continuus, saepe cum strato cellularum emortuarum aut funiculis amorphis plus minusve periclinalibus; stratum gonidiale 55–60 μ crassitudine, coloniis minutis sparsisque, cellulis 7–8 μ diametro; medulla hyphis laxe reticulatimque implexis; stratum basale non bene evolutum, simile cortici sed crassius.

Apothecia ad 0.50 mm. diametro, subspherica, convexa, sessilia, singula vel caespitosa, carbonacea, nigra; parathecium ad 200 μ crassitudine, cellulis fuscis pachydermaticis, ad 5 μ diametro; hypothecium inconspicuum, 10–20 μ crassitudine cum parathecio continuum, cellulis pseudoparenchymaticis; thecium 30–40 μ altitudine; paraphyses 1–2.5 μ diametro, apicibus ad 2.5 μ, pachydermatici, septati, ramosi vel non-ramosi, vaginati, capitibus non obscuris vel incrustatis, epithecium 5–8 μ, nigrum, KOH addito viridescens; asci 24–28(–32) × 12.5–14 μ, parvi, breve clavati, vagina non prominente; ascosporae octonae, monostichae, elongato-ellipsoideae, late vaginatae, 7.5–10 × 2–3 μ.

Thallus scant, a few mm. at most in diameter, well developed, tough, gelified when moistened, irregularly areolate, on rocks, whitish; cortex of fastigiate cells, not continuous, often with a conspicuous layer of dead cortical cells covering the outer surface, seemingly built of amorphous strands, more or less periclinal; algal layer 55–60 μ thick, of small scattered colonies, cells 7–8 μ in diameter; medulla of loosely reticulate hyphae; basal layer not morphologically distinct from the cortex, although frequently a few layers thicker.

Apothecia up to 0.50 mm. in diameter, subspherical in outline, convex, not flattened, sessile on the assimilative areolae, single to closely clustered and heaped, carbonaceous, black; parathecium up to 200 μ thick, of heavy-walled fuscous cells up to 5 μ in diameter in a conspicuous concentric palisade, disappearing abruptly below into the thinner-walled hyaline cells of the medulla; hypothecium inconspicuous, 10–20 μ thick, continuous with the parathecium, of thick-walled fuscous cells nearly isodiametric; thecium 30–40 μ high; paraphyses 1–2.5 μ in diameter, expanding slightly to 2.5 μ at the tips, thick-walled, septate, branched or unbranched, gelified sheath prominent, tips not darkened or incrusted; epithecium 5–8 μ thick, dark turning green with KOH; asci 24–28(–32) × 12.5–14 μ, 8-spored, small, short-clavate, especially at maturity, sheath not prominent; spores monostichous, 7.5–10 × 2–3 μ, elongate-ellipsoidal with a broad sheath.

On coarse- or fine-grained crypto-crystalline pinkish-gray granite, sericite-orthoclase schist, and arkosic sandstone.

MARIE BYRD LAND: Edsel Ford Range, Lichen Peak, *P. Siple & S. Corey 73-6*, type; Mt. Grace McKinley, *P. Siple, F. A. Wade, S. Corey & O. D. Stancliff McK-2, McK-3, McK-5*.

LECIDEA **Byrdii** Dodge & Baker, sp. nov. Pl. 40, figs. 39–41.

Type: Marie Byrd Land, Edsel Ford Range, Garland Hershey Ridge, *P. Siple & S. Corey 5-2.*

Thallus parvus, sparsus, crustosus, areolatus, albidus; cortex non evolutus, superficies thalli strato cellularum emortuarum ad 20 μ crassitudine tecta; algae protococcoideae, ad 12 μ diametro, coloniis magnis per totum thallum dispositis; medulla hyphis tenuibus circa 2 μ diametro reticulatim dispositis, sub apotheciis verticaliter et plus minusve parallele dispositis; stratum basale non evolutum.

Apothecia ad 0.675 mm. diametro, irregularia, pulvinata, sessilia, nigra, carbonacea; parathecium non bene evolutum; hypothecium 20–30 μ crassitudine, non tenuescens, hyphis tenuibus dense reticulatis, hyalinum; thecium 40–60 μ altitudine; paraphyses 1–1.5 μ diametro, apicibus non inflatis, septati, raro ramosi, vaginati, epithecium 5–8 μ, carbonaceum, asperum; asci 30–44 × 14–20 μ, late clavati, obtusi, tenuiter vaginati; ascosporae octonae, 10–11 × 5–6 μ, late ellipsoideae, apicibus obtusis, juventute conspicue, maturitate tenuiter, vaginatae.

Thallus a few mm. in diameter, scattered, scant, crustose, areolate, whitish, closely attached to the rock; upper cortex lacking, the outer surface protected by a layer of dead cells as much as 20 μ thick; algae *Protococcus,* cells up to 12 μ in diameter abundant, in large colonies throughout the areolae; medulla of slender hyphae about 2 μ in diameter, closely anastomosed in loosely woven strands, near the surface hyphae more coarsely reticulate and apparently devoid of contents, medullar hyphae below the apothecia more or less parallel and vertical; lower cortex not differentiated.

Apothecia up to 0.675 mm. in diameter, irregularly circular in outline, pulvinate, sessile, black, carbonaceous; parathecium not differentiated beyond a few cells which merge with the marginal cells; hypothecium 20–30 μ thick, not tapering, of slender, closely reticulate hyphae, hyaline; thecium 40–60 μ tall; paraphyses 1–1.5 μ in diameter, tips not expanded, septate, rarely branched, with a thin gelified sheath and black incrustations adhering to the outer surfaces, epithecium 5–8 μ, carbonaceous, rough; asci 30–44 × 14–20 μ, 8-spored, broadly clavate, blunt on the ends, with a small gelified sheath; ascospores 10–11 × 5–6 μ, broadly ellipsoid, ends blunt, surrounded by a hyaline sheath which is especially prominent on the young spores but decreases with maturity.

MARIE BYRD LAND: Edsel Ford Range, Garland Hershey Ridge, *P. Siple & S. Corey 5-2.*

LECIDEA **ecorticata** Dodge & Baker, sp. nov.

Pl. 40, figs. 35–38.

Type: Marie Byrd Land, Edsel Ford Range, Mt. Rea-Cooper, *P. Siple, F. A. Wade, S. Corey & O. D. Stancliff R-7(1).*

Thallus minimus, 0.5 mm. diametro, pustularis, irregulariter areolatus, gelifactus madefactus, albus vel dilute olivaceo-alutaceus; cortex non evolutus; algae paucae, sparsae ad superficiem; medulla laxa, hyphis reticulatim dispositis; stratum basale cellulis fastigiatis obscuris.

Apothecia ad 0.315 mm., juventute concava, maturitate subconvexa, saepe submarginata, sparsa, sessilia, nigra, carbonacea; parathecium ad 25 μ, ad margines tenuescens, 5–10 μ; hypothecium ad 150 μ, obscurum, pseudoparenchymaticum; thecium ad 60 μ altitudine; paraphyses 0.5–1.5 μ crassitudine, graciles, apicibus ad 2 μ, non obscuris, ramosi vel non ramosi, vaginati, brunnei, gelifacti, epithecium 8–10 μ, obscurum; asci 40–48 × 19–22 μ, bulbosi, basi attenuato, vaginati; ascosporae octonae, 10–14 × 5–7 μ, ellipsoideae vel ovoideae, vaginatae, hyalinae, unicellulares.

Thallus small, not more than 0.5 mm. in diameter, pustular, irregularly areolate, gelified when moist, white to pale olive buff; upper cortex not differentiated; algae few, scattered near the upper surface; medulla of loose reticulately woven hyphae; basal cortex of darkened fastigiate cells sometimes extending into the medulla up to 30 μ.

Apothecia up to 0.315 mm. in diameter, concave when young to slightly convex at maturity, often with a slight rim, mostly scattered, sessile on the assimilative thallus; parathecium distinct up to 25 μ, tapering to 5–10 μ at the point of convergence with the epithecium; hypothecium up to 150 μ, tapering slightly from the center to the margin, dark, more or less pseudoparenchymatous; thecium about 60 μ tall; paraphyses 0.5–1.5 μ, slender, slightly expanded, the tips sometimes up to 2 μ, not darkened, branched or unbranched with prominent sheath, the whole rather gelified, brownish, epithecium 8–10 μ thick, dark; asci 40–48 × 19–22 μ, 8-spored, bulbous with a somewhat attenuate base, sheath prominent from early stages; ascospores 10–14 × 5–7 μ, ellipsoidal to ovoid with a distinct hyaline sheath, hyaline, unicellular.

On coarse-grained gray granite.

MARIE BYRD LAND: Edsel Ford Range, Mt. Rea-Cooper, *P. Siple, F. A. Wade, S. Corey & O. D. Stancliff R-7, R-7 (1)*, type.

LECIDEA **Stancliffi** Dodge & Baker, sp. nov.

Pl. 40, fig. 42; pl. 41, figs. 43–45.

Type: Marie Byrd Land, Edsel Ford Range, Lichen Peak, *P. Siple & S. Corey 73-10.*

Thallus parvus, 3–4 mm. diametro, plus minusve areolatus, albus vel cremeo-alutaceus; cortex ad 40 μ, cellulis obscuris fastigiatis irregularibus, saepe strato cellularum emortuarum ad 40 μ crassitudine tectus; stratum gonidiale 50–170 μ crassitudine, cellulis coloniisque subverticaliter dispositis; medulla ad 650 μ crassitudine, hyphis laxe reticulatimque implexis; stratum basale non evolutum sed hyphis medullaribus inferis subobscuris, non pachydermatiscens.

Apothecia ad 0.6 mm. diametro, circularia, applanata, marginata vel emarginata, gregaria vel caespitosa, nigra, nitida; parathecium non evolutum; hypothecium ad 30 μ, hyalinum, hyphis leptodermaticis periclinalibus compactis; thecium ad 70 μ altitudine; paraphyses 1.5–2.5 μ, apicibus obscuris, 4–5 μ, septati, ramosi, raro non ramosi, pachydermatici, epithecium ad 10 μ crassitudine, obscurum, subgelifactum, KOH addito dilute virescens; asci 36–45 × 14–15 μ, late clavati; ascosporae octonae, (7–)8–10.5 × 3.5–5(–6) μ, ovoideae vel subsphericae, vaginatae.

Thallus 3–4 mm. in diameter, scant, compact, more or less areolate, white to cream-buff; upper cortex up to 40 μ thick, of darkened fastigiate cells, at most a few rows deep and irregularly distributed, often covered by a conspicuous layer of dead cortical cells as thick as 40 μ; algal layer 50–170 μ thick, individual cells and small colonies more or less vertically arranged; medulla up to 650 μ thick, of loosely reticulate hyphae; basal layer not developed but the medullar hyphae somewhat darkened, not thickened.

Apothecia up to 0.6 mm. in diameter, more or less circular, usually flattened, with or without a differentiated margin, closely gregarious or heaped, black, shining; parathecium not differentiated beyond a few cells merging with the margin; hypothecium up to 30 μ, hyaline, not tapering, of thin-walled more or less periclinal hyphae closely united; thecium up to 70 μ tall; paraphyses 1.5–2-5 μ, expanding to 4–5 μ above, septate, branched or rarely unbranched, thick-walled, heads with darkened outer caps, epithecium up to 10 μ thick, dark, slightly gelified, turning slightly greenish with KOH; asci 36–45 × 14–15 μ, 8-spored, broadly clavate; ascospores (7–)8–10.5 × 3.5–5(–6) μ, ovoid to subspherical, with a prominent sheath.

On cemented particles of crypto-crystalline gray granite and

weathered coarse pinkish or gray granite or on sericite-orthoclase schist.

MARIE BYRD LAND: Edsel Ford Range, Lichen Peak, *P. Siple & S. Corey 73-10*, type; Mt. Rea-Cooper, *P. Siple, F. A. Wade, S. Corey & O. D. Stancliff R-7*; Mt. Grace McKinley, *P. Siple, F. A. Wade, S. Corey & O. D. Stancliff McK-8.*

LECIDEA **cancriformis** Dodge & Baker, sp. nov.

Pl. 41, figs. 46–52; pl. 63, fig. 409.

Type: South Victoria Land, Queen Maud Mts., Scudder Mt., 86°03′ S., 150°40′ W., *Q. A. Blackburn, R. S. Russell Jr. & S. D. L. Paine QM-6(2).*

Thallus areolatus, ad 0.5 mm. latitudine, funiculis plura apothecia gerentibus, griseo-albidus, gelifactus madefactus, irregularis, plus minusve verrucosus; cortex 2–8 μ crassitudine, brunneus, cellulis parvis fastigiatis ad 2 μ diametro et strato cellularum emortuarum ad 40 μ diametro; stratum gonidiale ad 100 μ crassitudine, cellulis protococcoideis ad 10 μ diametro; medulla ad 1200 μ crassitudine, hyphis ad 2 μ, ad basim verticaliter, insuper reticulatim, dispositis.

Apothecia ad 1.5 mm., irregularia, saepe angulata, convexa vel pulvinata, emarginata, gregaria, nigra, carbonacea, basi constricta; parathecium paucis cellulis in cortice mergens; hypothecium ad 100 μ crassitudine, irregulariter in medullam ad 450 μ penetrans, cellulis pachydermaticis, 2 μ diametro, obscure fusco-brunneis, subparallelis, verticaliter dispositis; thecium ad 70 μ altitudine; paraphyses 1.0–1.5 diametro, capitibus 3.0–4.0 μ diametro, non ramosi vel ramosi, pachydermatici, septati, epithecium ad 10 μ crassitudine, carbonaceum, superficie irregulari, KOH addito virescens; asci 25–42 × 8–12 μ, subtus attenuati, superne inflati; ascosporae octonae, subfasciculatae, 6.5–7.5 × 1.7–2.5 μ, ellipsoideae, una apice subacuta.

Thallus up to 0.5 mm. wide, usually in long strands bearing several apothecia, areolate, grayish white, gelified when moist, irregular in shape, more or less verrucose, small and inconspicuous in comparison with the apothecia; upper cortex 2–8 μ thick, brownish, of small fastigiate cells up to 2 μ in diameter which terminate the hyphae of the medulla, with a thick layer of dead cells on the surface up to 40 μ thick; algal layer up to 100 μ thick, of protococcoid cells up to 10 μ in diameter; medulla up to 1200 μ thick, of reticulately arranged hyphae up to 2 μ in diameter, more or less vertical toward the base of the areolae; lower cortex not differentiated.

Apothecia up to 1.5 mm. in diameter, irregularly circular becoming angled by mutual pressure, convex to pulvinate, emarginate, abundant, gregarious, black, carbonaceous, constricted

at the base, subsessile to substipitate on the areolae; parathecium of a few cells which merge laterally with the marginal cortex; hypothecium up to 100 μ thick, extending irregularly into the medulla, occasionally as much as 450 μ, of dark fuscous brown cells about 2 μ in diameter, more or less parallel and vertical; thecium up to 70 μ tall; paraphyses 1.0–1.5 μ, expanding to heads 3.0–4.0 μ in diameter which are hyaline and incrusted with carbonaceous fragments unbranched or branched, thick-walled, septate, epithecium about 10 μ thick, carbonaceous, surface irregular, turning green with KOH; asci 25–42 × 8–12 μ, 8-spored, attenuate below, inflated above, giving a bulbous appearance to the mature ascus; ascospores subfasciculate, 6.5–7.5 × 1.7–2.5 μ, ellipsoidal, one end sometimes pointed.

On coarse-grained granite weathering reddish brown, and on fine-grained gray granite.

KING EDWARD VII LAND: Rockefeller Mts., Mt. Helen Washington, *P. Siple, F. A. Wade, S. Corey & O. D. Stancliff HW-8.*

SOUTH VICTORIA LAND: Queen Maud Mts., Scudder Mt., Station 9, 86° 03′ S., 150° 40′ W., *Q. A. Blackburn, R. S. Russell Jr. & S. D. L. Paine QM-2, QM-6 (1), (2),* type, *(3), (4);* N.E. Durham Point, east portal Thorne Glacier, *Q. A. Blackburn, R. S. Russell Jr. & S. D. L. Paine QM-3(84), QM-4(83).*

LECIDEA **Blackburni** Dodge & Baker, sp. nov.

Pl. 41, figs. 53–56.

Type: South Victoria Land, Queen Maud Mts., Scudder Mt., 86° 03′ S., 150° 40′ W., *Q. A. Blackburn, R. S. Russell Jr. & S. D. L. Paine QM-6(2).*

Hypothallus paucis obscuris funiculis hypharum irregularum; cortex medullaque non evoluta, areas 4–5 mm. diametro dendritice tegens; areolae assimilantes ad 0.75 mm. diametro, irregulares, molles vel gelifactae madefactae, pallide olivaceo-alutaceae vel citrino-ravae; cortex 10–18 μ, cellulis parvis fastigiatis dilute vel obscure brunneis, strato denso amorpho cellularum emortuarum ad 20 μ crassitudine tectus; stratum gonidiale 80–100 μ crassitudine, cellulis ad 15 μ diametro confertis; medulla ad 850 μ crassitudine, hyphis 1–1.5 μ diametro reticulatim dispositis, circum algas densius; stratum basale non evolutum.

Apothecia 0.2 × 0.5 mm. aut ad 0.5 mm. diametro, irregulariter elliptica vel circularia, plus minusve applanata, marginata, sessilia, conferte gregaria sparsave, nigra, subnitida; parathecium paucis cellulis in corticem mergens; cortex marginalis bene evolutus, ad 25 μ crassitudine, cellulis magnis isodiametricis carbonaceis; hypothecium 60–70 μ, fusco-brunneum, ad margines tenuescens, pseudoparenchyma-

ticum cellulis pachydermaticis; thecium 50–90 μ altitudine; paraphyses 1 μ, capitibus ad 3 μ, obscuris, non incrustatis, non ramosi vel ad apices ramosi, epithecium 8–12 μ, carbonaceum, asperum, KOH addito virescens; asci (37–)52–60 × 9–11 μ, elongato-clavati, non abrupte inflati ut in *Lecidea cancriformi;* ascosporae 6.5–8.5 × 2–2.5 μ, ellipsoideae, apicibus rotundatis.

Non-assimilative portion represented by a few black strands composed of dark, irregular hyphae, not distinguished morphologically into cortex and medulla, dendritic, extending over areas 4–5 mm. in diameter; assimilative portion up to 0.75 mm., irregularly areolate, soft to gelified when moist, pale olive buff to citrine drab; cortex 10–18 μ thick, of several layers of small fastigiate cells, light to dark brown in the outer layers, the whole covered by a layer of dead cells, amorphous, up to 20 μ thick; algal layer 80–100 μ thick, cells up to 15 μ in diameter, abundant and closely packed; medulla up to 850 μ thick, of slender hyphae 1–1.5 μ in diameter reticulately arranged, more compactly about the algae; lower cortex absent.

Apothecia 0.2 × 0.5 mm. or up to 0.5 mm. in diameter, irregularly elliptical to circular in outline, more or less flattened with a distinct margin, sessile, closely crowded or scattered, black, somewhat shining; parathecium consisting of a few cells merging with the marginal cortex which is well developed, up to 25 μ thick, of large isodiametric cells, carbonaceous, fusing with the epithecium above and the thalline cortex below; hypothecium 60–70 μ, fuscous brown, slightly tapering from the center to the margin, of thick-walled pseudoparenchyma; thecium 50–90 μ tall; paraphyses 1 μ, heads up to 3 μ, darkened, without incrustations, unbranched or branched near the apex, epithecium 8–12 μ thick, carbonaceous, rough, turning green with KOH; asci (37–)52–60 × 9–11 μ, 8-spored, long, slender-clavate, expanding gradually from the attenuate base and not abruptly as in *Lecidea cancriformis;* ascospores 6.5–8.5 × 2–2.5 μ, ellipsoidal, slender, with rounded ends.

On fine-grained gray and pinkish granite.

South Victoria Land: Queen Maud Mts., Durham Point, northeast portal Thorne Glacier, *Q. A. Blackburn, R. S. Russell Jr., S. D. L. Paine QM-4 (83)*; Scudder Mt., 86°03′ S., 150°40′ W., *Q. A. Blackburn, R. S. Russell Jr., S. D. L. Paine QM-6 (1), (2)*, type, *(3), (4)*.

LECIDEA **Painei** Dodge & Baker, sp. nov. Pl. 41, figs. 57–62.

Type: South Victoria Land, Queen Maud Mts., Scudder Mt. (B), Station 9, 86° 03′ S., 150° 40′ W., *Q. A. Blackburn, R. S. Russell Jr. & S. D. L. Paine QM-2.*

Thallus ad 2 mm. diametro, irregularis, plus minusve areolatus, arachnoideus vel compactior, mollis gelifactusque madefactus, griseo-albidus; cortex ad 12 μ, fastigiatus, cellulis terminalibus hypharum medullae inflatis obscurisque, ad 4 μ diametro, non continuus, superficie strato irregulari cellularum emortuarum 25–30 μ crassitudine tectus; algae sub cortice coloniis parvis sparsis, cellulis ad 8 μ diametro; medulla hyphis 1–3 μ diametro, in funiculis compactis magnis laxe reticulatimque dispositis; cortex inferior deest aut paucis cellulis obscuris fastigiatis ut in cortice superiori.

Apothecia ad 0.27 mm., parva, irregulariter circularia, emarginata, convexa, sparsa vel gregaria, sessilia, nigra, carbonacea; cortex marginalis ad 35 μ, carbonaceus, pseudoparenchymaticus, cellulis pachydermaticis apice in epithecio mergens; hypothecium ad 20 μ, griseum vel fuscum, cellulis parvis, irregulariter pseudoparenchymaticis ad margines, subtenuescens; thecium ad 50 μ altitudine; paraphyses 0.75–1.0 μ diametro, recti neque inflati neque obscuri, non ramosi aut raro ramosi, tenuiter vaginati, epithecium 5–10 μ, irregulare, carbonaceum, KOH addito virescens; asci 23–31 × 6–9 μ, breves, obtuse clavati, apicibus vaginatis; ascosporae octonae, 6–6.5 × 3.5–5 μ, ovoideae vel breviter ellipsoideae, hyalinae, vaginatae.

Thallus up to 2 mm. in diameter, irregular, more or less areolate, arachnoid to more compact, soft and gelified when moist, dull grayish-white; upper cortex as much as 12 μ thick, of the enlarged and darkened terminal cells of the medulla, fastigiately arranged, not continuous as in *Lecidea cancriformis* and *L. Blackburni,* but of larger cells up to 4 μ in diameter, usually not more than a few cells thick, the whole covered by a more or less irregular layer of dead cells 25–30 μ thick at its best development; algae in scattered colonies below the cortex, cells up to 8 μ; medulla extensive, of slender hyphae 1–3 μ in diameter, closely packed in large, loose reticulate strands; lower cortex lacking or occasionally represented by scattered dark fastigiate cells as in the upper cortex.

Apothecia up to 0.27 mm., small, irregularly circular, emarginate, convex, numerous, scattered or closely grouped, sessile on the thallus, black, carbonaceous; marginal cortex up to 35 μ thick, carbonaceous, of thick-walled pseudoparenchyma, merging at the top with the epithecium, below thinning out and finally disappearing; hypothecium about 20 μ, grayish to fus-

cous, of small irregularly pseudoparenchymatous cells, tapering slightly; thecium up to 50 μ tall; paraphyses 0.75 to 1 μ in diameter, straight, tips neither expanded nor darkened, unbranched, rarely branched, with a narrow sheath, epithecium 5–10 μ thick, irregular, carbonaceous, turning green with KOH; asci 23–31 × 6–9 μ, 8-spored, short, bluntly clavate with a fairly prominent gelified sheath over the top; ascospores 6–6.5 × 3.5–5 μ, hyaline, short-ellipsoid or ovoid with a conspicuous hyaline sheath.

On granitic sandy loam.

South Victoria Land: Queen Maud Mts., Scudder Mt. (B), Station 9, 86° 03′ S., 150° 40′ W., *Q. A. Blackburn, R. S. Russell Jr. & S. D. L. Paine QM-2*, type.

CATILLARIA

Catillaria Massalongo, Richerche Auton. Lich. 78. 1852.

The type species is *C. chalybeia* (Borrer) Mass. (*C. lutosa* (Mont.) Mass.). Originally included in the genus, it was reduced to synonymy with *C. Philippaea* by Massalongo in 1856. *C concreta* Mass. belongs in *Rhizocarpon*.

Thallus crustose, endo- or epilithic, simple or with effigurate margins, attached to the substrate by the hyphae of the prothallus and the medulla, not corticate; algae *Protococcus* (cells in colonies suggesting *Gloeocapsa* in some species of sect. *Biatorina)*. Apothecia circular, immersed to sessile, with hyaline, colored, or black parathecium, without amphithecium, epithecium concave or convex, light or dark-colored; hypothecium hyaline, colored or black; paraphyses not or sometimes branched, tips capitate, free or immersed in a gel; asci 8-spored; spores usually small (under 30 μ), hyaline, ovoid, ellipsoid, or elongate and bacilliform, straight or curved, finally 2-celled with thin wall and thin septum, without a sheath. Spermogonia ellipsoidal to flask-shaped, spermatia straight or slightly curved.

The genus is usually divided into two sections: *Biatorina*, with hyaline or colored parathecium and hypothecium; and *Eucatillaria*, with carbonaceous parathecium and hypothecium. These sections were originally described as genera by Massalongo and are frequently so considered. Of our five

Antarctic species here reported for the first time, two belong in *Biatorina,* and three in *Eucatillaria.*

KEY TO ANTARCTIC SPECIES

Hypothecium dark brown to black; asci under 50 μ; spores under 15 μ long.... ....EUCATILLARIA

Paraphyses capitate with a smooth dark cap; thallus small, arachnoid to areolate, gelified..*C. cremea*

Paraphyses with slightly expanded hyaline tips 2 μ long; thallus granulose, not gelified..*C. granulosa*

Paraphyses not capitate, highly gelified; thallus large, floccose to calcareous when dry, gelified when moist..............................*C. floccosa*

Hypothecium hyaline or very light brown; asci over 54 μ; spores over 15 μ long; paraphyses capitate...BIATORINA

Paraphyses with conspicuous gelified sheath; thallus scant, grayish over a conspicuous reticulate hypothallus; thecium 80–90 μ, epithecium dark ....*C. inconspicua*

Paraphyses with slightly gelified sheath; thallus abundant, indeterminate, somewhat arachnoid, cream-colored; hypothallus not developed; thecium 50–60 μ tall, epithecium light.............................*C. arachnoidea*

CATILLARIA **cremea** Dodge & Baker, sp. nov.

Pl. 42, figs. 68–71.

Type: Marie Byrd Land, Edsel Ford Range, Skua Gull Peak, *P. Siple & S. Corey 72W-8.*

Thallus ad 1 cm. diametro, arachnoideus vel areolatus et diffractus, gelifactus madefactus, albidus vel cremeus, saepe ab ochra saxorum tinctus, saxicola; cortex male evolutus, in marginibus rimisque areolarum paucis cellulis obscurioribus fastigiatis munitus, super algas amorphus; stratum gonidiale 65 μ crassitudine, cellulis ad 7 μ in coloniis sphericis, protococcoideis; medulla hyphis laxe reticulatis contexta; stratum basale 50–75 μ, cellulis compactioribus, brunneis obscurius, irregulariter dispositis, non fastigiatis.

Apothecia ad 0.35 mm. diametro, irregularia, applanata, sparsa, emarginata, raro subconcava, sessilia, nigra; parathecium ad 50 μ crassitudine, nigrum, carbonaceum, hypothecio mergens; hypothecium ad 75 μ crassitudine, obscure brunneum vel carbonaceum; thecium circa 50 μ crassitudine; paraphyses 0.75–1.0 μ, capitibus 1.5–2.5 μ, non ramosi, subflexuosi, graciles, epithecium circa 10 μ, obscurum; asci 31–37 × 12–15 μ, late clavati, vagina prominente; sporae octonae, 11–14 × 3–4 μ, uniseptatae, longae, ellipsoideae, apicibus frequenter truncatis.

Assimilative thallus thinly diffused over 1 cm., slightly arachnoid to areolate and fairly deeply cracked, gelified when moist, white to cream, often rusty and discolored from the sub-

strate; cortex poorly developed, sometimes with a few darker fastigiate cells appearing in the cracks and on the sides of the areolae, amorphous over the tops of the areolae; algal layer 65 μ thick, cells protococcoid, up to 7 μ in diameter, in more or less spherical colonies; medulla simple, of loosely reticulate strands; basal cortex 50–75 μ, of more compact cells, darker brown, irregularly arranged, not fastigiate.

Apothecia up to 0.35 mm. in diameter, irregular in outline, flattened, scattered, emarginate, sometimes slightly concave, sessile on the areolae, black; parathecium up to 50 μ thick, black, carbonaceous, merging with the hypothecium which is up to 75 μ thick, light to dark brown and carbonaceous; thecium about 50 μ thick; paraphyses 0.75–1.0 μ, expanding to 1.5–2.5 μ at the heads, even, smooth on the outer surfaces of the heads with a dark cap, mostly unbranched, somewhat flexuous, slender, epithecium about 10 μ, dark; asci 31–37 × 12–15 μ, short, broadly clavate, especially when mature, sheath rather prominent, 8-spored; ascospores fasciculate (vertically aligned at maturity), 11–14 × 3–4 μ, uniseptate, long, slender-ellipsoidal, sometimes with truncate ends.

On dark greenish gray slate.

Marie Byrd Land: Edsel Ford Range, Skua Gull Peak, *P. Siple & S. Corey 72W-8*, type.

Catillaria **floccosa** Dodge & Baker, sp. nov.

Pl. 42, figs. 63–67.

Type: Marie Byrd Land, Edsel Ford Range, Skua Gull Peak, *P. Siple & S. Corey 72W-2*.

Thallus bene evolutus, floccosus vel calcareus siccatus, gelifactus pustularisque madefactus, albidus vel viridescens; cortex male evolutus, catervis sparsis cellularum obscurarum fastigiatarum; stratum gonidiale circa 150 μ crassitudine, coloniis dispersis, cellulis 6–7 μ diametro; medulla ad 300 μ crassitudine, hyphis tenuissimis reticulatim dispositis, compactioribus ad algas; stratum basale 15 μ crassitudine, simile cortici. Cephalodia cum algis nostocaceis sub strato basali abundanter dispersa.

Apothecia ad 0.35 mm., frequenter circa 0.20 mm., sessilia, irregularia, convexa, in columnis thalli, sparsa, nigra, nitida; parathecium 10–12 μ crassitudine, nigrum; hypothecium ad 20 μ, cellulis nigris, plus minusve reticulatim dispositis; thecium 50–70 μ crassitudine; paraphyses 1.5–2 μ diametro, cellulis brevibus crassis brun-

neis gelifactis, apicibus vix inflatis, epithecium 4–5 μ, obscurum; asci 29–48 × 12–16 μ, elongati, apicibus vaginatis; sporae octonae, 11.5–15 × 3.5–6.5 μ, uniseptatae, non constrictae, alia cellula obtusa vel obtusior quam altera, acuta.

Assimilative portions of thallus well developed, on rock or among loose gravel and mosses, covering areas of several centimeters, floccose to calcareous when dry, gelified and pustular when moist, white to greenish from an abundance of included algae; cortex evanescent, represented by groups of dark fastigiate cells variable in size, scattered here and there over individual pustules; algal layer about 150 μ thick, of scattered colonies, cells 6–7 μ in diameter; medulla up to 300 μ thick, of very delicate hyphae in a loose net, mostly exposed at the surface, better developed and more compact about the colonies of algae; basal layer identical, with scattered dark cortical cells but continuous, about 15 μ thick. Cephalodia with *Nostoc* abundant on the under-side of the basal layer.

Apothecia up to 0.35 mm. in diameter, usually about 0.20 mm., sessile, capping the pillars of the assimilative portions, irregular, convex, scattered and irregular in distribution, black, shining; parathecium 10–12 μ thick, black; hypothecium up to 20 μ, not much diminished laterally, merging with the parathecium, of dark compact cells more or less reticulately arranged; thecium 50–70 μ thick; paraphyses 1.5–2 μ in diameter, of short thick brownish cells, not very distinct as they are highly gelified, tips scarcely inflated, epithecium 4–5 μ, dark; asci 29–48 × 12–16 μ, 8-spored, elongate, the apex pointed, covered with a fairly prominent sheath; spores 11.5–15 × 3.5–6.5 μ, uniseptate, not constricted, one cell usually blunt or blunter than the other which is either distinctly pointed or tapering.

On loose sandy loam from coarse-grained gray granite, granodiorite, and fine-grained dike.

KING EDWARD VII LAND: Rockefeller Mts., Mt. Helen Washington, *P. Siple, F. A. Wade, S. Corey & O. D. Stancliff HW-7.*

MARIE BYRD LAND: Edsel Ford Range, Skua Gull Peak, *P. Siple & S. Corey 72W-2*, type, *72W-14*; Lichen Peak, *P. Siple & S. Corey 73-3, 73-4, 73-7*; Chester Mts., *P. Siple & S. Corey 97A-1, 97A-2*; Mt. Rea-Cooper, *P. Siple, F. A. Wade, S. Corey & O. D. Stancliff R-4, R-6, R-2 (sterile)*; Mt. Donald Woodward, *P. Siple, F. A. Wade, S. Corey & O. D. Stancliff DW-1.*

CATILLARIA **granulosa** Dodge & Baker, sp. nov.

Pl. 43, figs. 78–83.

Type: King Edward VII Land, Rockefeller Mts., Mt. Helen Washington, *P. Siple, F. A. Wade, S. Corey & O. D. Stancliff HW-10.*

Thallus ad 11 mm. diametro; areolae assimilantes 0.05–0.15 mm. diametro, granulosae, parvae, numerosae, albidae vel ravae, ecorticatae; algae protococcoideae, ad 8 μ diametro, rarissimae, in toto thallo sparsae; medulla hyphis obscure brunneis fuscisve, irregulariter sparsis, amorpha, coloniis bacteriorum interspersis.

Apothecia 0.1–0.33 mm. diametro, plerumque parva, singula vel caespitosa, fusca nigrave, subconcava, excipulo tenuissimo; amphithecium deest; parathecium 25–40 μ crassitudine, cellulis pachydermaticis fuscis isodiametricis, basaliter tenuescens; hypothecium 10–20 μ crassitudine, fuscum, plectenchymaticum; thecium 50–60 μ altitudine; paraphyses 1 μ diametro, apicibus ad 2 μ, hyalini, epithecium 10–20 μ, brunneum, gelifactum; asci 40–44 × (12–)15–18 μ, late clavati insuper, basaliter constricti; ascosporae 11–12 × 5–6 μ, ellipsoideae, una ex cellulis majore, ovoidea, hyalinae.

Thallus over areas up to 11 mm. in diameter; non-assimilative portion absent, assimilative areolae 0.05–0.15 mm., granular to pustular, small, numerous, whitish to drab; cortex lacking; algae protococcoid, up to 8 μ in diameter, very rare, and irregularly scattered throughout the thallus; medulla amorphous with dark brown hyphae irregularly distributed; frequently with large clumps of bacteria within the interstices.

Apothecia 0.1–0.33 mm. in diameter, mostly small, slightly concave with a faint exciple; amphithecium absent; parathecium 25–40 μ thick, well developed, of thick-walled isodiametric cells up to 3 μ forming a compact tissue, tapering below and disappearing in the region of the hypothecium; hypothecium 10–20 μ thick, dark, of closely woven hyphae somewhat fimbriate; thecium 50–60 μ tall; paraphyses 1 μ, slightly expanding above, reaching 2 μ at the tips, not darkened, epithecium 10–20 μ, brown, gelified; asci 40–44 × (12–) 15–18 μ, very broad-clavate above and constricted below, 8-spored; ascospores 11–12 × 5–6 μ, hyaline, ellipsoidal, becoming 2-celled, each cell uninucleate, one cell usually somewhat exceeding the other and more ovoid.

On weathered coarse-grained reddish brown granite.

KING EDWARD VII LAND: Rockefeller Mts., Mt. Helen Washington, *P. Siple, F. A. Wade, S. Corey & O. D. Stancliff HW-10*, type.

Catillaria **inconspicua** Dodge & Baker, sp. nov.

Pl. 43, figs. 84–87.

Type: Marie Byrd Land, Edsel Ford Range, Chester Mts., *P. Siple & S. Corey 97A-1.*

Thallus non assimilans niger, inconspicuus, reticulis parvis; cortex hyphis magnis obscuris, ramis per omnia irregulariter percurrentibus; medulla hyphis hyalinis tenuioribus reticulatim dispositis vel compactioribus; partes assimilantes griseae, paucae in areas 1 cm. diametro dispersae; cortex prominens, cellulis parvis fastigiatis paullo obscuris; stratum gonidiale 55–60 μ crassitudine, cellulis singulis, binis vel in coloniis parvis plus minusve verticaliter dispositis; medulla hyphis tenuibus ad corticem dendritice ramosis; stratum basale non bene evolutum, cellulis magnis obscuris fastigiatis.

Apothecia ad 1.35 mm. diametro, sessilia in areolis assimilantibus, pulvinata, convexa, irregularia, nigra, carbonacea, sparsa; cortex non evolutus; hypothecium 20–25 μ, hyalinum, hyphis parvis periclinalibus; thecium 80–90 μ altitudine; paraphyses circa 1 μ diametro, capitibus ad 4.5 μ, subobscuris, vaginatis, ramosi vel non ramosi, subflexui, epithecium ad 10 μ crassitudine, obscurum, addito KOH purpurascens; asci 56–67 × 14–16 μ, elongati, clavati, vaginati; sporae octonae, 15–19 × 4.5–7 μ, uniseptatae, elongatae, ellipsoideae, raro reniformes vel naviculares, non constrictae.

Non-assimilative portions of the thallus finely reticulate, black, very inconspicuous against the rock, of coarse dark hyphae forming the cortex and ramifying irregularly throughout the whole thallus; medulla of more slender hyaline hyphae forming fine reticulations, becoming more compact in places; assimilative portions scant over areas of 1 cm., grayish; cortex prominent, of small fastigiate cells little darkened; algal layer 55–60 μ thick, cells single, in pairs or small colonies more or less vertically arranged; medulla of slender loose cells branching in the subcortical region; basal layer not sharply differentiated, often confluent with the non-assimilative parts which form the base in such cases, of large dark fastigiate cells, occasionally occurring laterally in scattered areas.

Apothecia up to 1.35 mm., sessile on the assimilative areolae, pulvinate, convex, irregular in outline, black, carbonaceous, scattered; cortex not differentiated; parathecium of a few hypothecial cells merging with the cortex of the assimilative parts and the epithecium; hypothecium 20–25 μ thick, hyaline, scarcely diminishing in thickness from the center to the margin, of slender periclinal hyphae very compactly woven;

thecium 80–90 μ tall; paraphyses about 1 μ in diameter, heads 4.5 μ, slightly darkened, sheath rather conspicuous, branched or unbranched, slightly flexuous, epithecium about 10 μ thick, dark, turning purple on the addition of KOH; asci 56–67 × 14–16 μ, quite elongate, clavate with a sheath, 8-spored; spores 15-19 × 4.5–7 μ, uniseptate, elongate-ellipsoidal, rarely reniform or navicular, not constricted at the septum.

The systematic position of *C. inconspicua* is uncertain. The apothecium rests on an assimilative areola no larger than the apothecium. If the assimilative tissue is regarded as an amphithecium, this species belongs in *Lecania* near *L. Racovitzae* but clearly is not that species, while if it is regarded as thallus, it belongs in *Catillaria*.

On coarse-grained gray granite.

Marie Byrd Land: Edsel Ford Range, Chester Mts., *P. Siple & S. Corey 97A-1*, type; Mt. Rea-Cooper, *P. Siple, F. A. Wade, S. Corey & O. D. Stancliff R-7 (1)*.

Catillaria **arachnoidea** Dodge & Baker, sp. nov.

Pl. 42, figs. 72–77; pl. 65, fig. 428.

Type: Marie Byrd Land, Edsel Ford Range, Mt. Rea-Cooper, *P. Siple, F. A. Wade, S. Corey & O. D. Stancliff R-7(1)*.

Thallus appressus, saxicola, conspicuus, indeterminatus, verrucosus, areolis ad 0.45 mm., irregularibus, angularibus, plus minusve arachnoideus, albidus vel cremeus; cortex evanescens, in marginibus areolarum, cellulis fastigiatis obscuris persistentibus; stratum gonidiale 85–90 μ crassitudine, cellulis coloniisque subverticaliter dispositis; medulla 220 μ crassitudine, hyphis 2–3 μ diametro, ramosis anastomosantibusque laxe implexis, compactior sub strato gonidiale apotheciisque, hyphis 1 μ diametro; stratum basale obscurum compactiusque.

Apothecia ad 0.33 mm. diametro, hemisphèrica vel irregularia, saepe angulata, plana vel convexa, emarginata, sparsa vel gregaria, sessilia, obscure brunnea vel nigra; cortex cellulis magnis nigris, 11–12 μ crassitudine; parathecium circa 20 μ crassitudine, cellulis obscure brunneis isodiametricis in cortice mergens; hypothecium ad 10 μ crassitudine, non prominens, hyalinum vel dilute brunneum, cellulis reticulatim dispositis; thecium 50–70 μ altitudine; paraphyses 1.5 μ diametro, capitibus 2.5 μ, non obscuris, gelifacti, ramosi vel non ramosi, epithecium 5–8 μ, non obscurum; asci 54–60 × 14–16 μ, elongato-clavati, vagina non prominente; ascosporae octonae, 15–18 × 4–6 μ, 1–2-septatae, non constrictae, elongatae, ellipsoideae, raro subreniformes vel naviculares.

Assimilative portion of thallus closely attached to rock, conspicuous and well developed, indeterminate, verrucose, areolae

up to 0.45 mm. long, irregular, angular, more or less arachnoid, white to cream-colored; cortex not well developed, occurring in scattered places on lateral margins of the areolae, of dark fastigiate cells, evanescent over the rest, leaving tissue similar to the medulla above the algal layer which is 85–90 μ thick with cells and colonies somewhat vertically arranged; medulla 220 μ thick, of open reticulate tissue, hyphae branched and anastomosed, 2–3 μ in diameter, slightly more compact about the algae and below the apothecia, hyphae about 1 μ in diameter; basal layer sometimes darker, and a little more compact than the medulla but not sharply differentiated from it.

Apothecia up to 0.33 mm. in diameter, hemispherical to irregular, often angled by mutual pressure when close together, plane or convex, sometimes with a slight depression when young but never distinctly margined, scattered or gregarious, sessile, dark brownish to black; cortex 11–12 μ thick, of large black cells; parathecium 20 μ thick, of dark brown, isodiametric cells merging with the cortex and becoming progressively thin-walled toward the thecium; hypothecium up to 10 μ thick, not prominent, hyaline or light brown, of reticulately arranged cells, not thinning conspicuously toward the margin; thecium 50–70 μ thick; paraphyses 1.5 μ, expanding slightly at the apices up to 2.5 μ in diameter, heads not darkened, with a close gelified sheath, branched or unbranched, epithecium 5–8 μ, light; asci 54–60 × 14–16 μ, elongate-clavate, sheath not prominent, 8-spored; ascospores 15–18 × 4–6 μ, becoming 1–2-septate, not constricted at the septa, elongate-ellipsoidal, occasionally somewhat reniform or even navicular.

On coarse-grained gray granite.

MARIE BYRD LAND: Edsel Ford Range, Mt. Rea-Cooper, *P. Siple, F. A. Wade, S. Corey & O. D. Stancliff R(26–27)-7, R-7(1)*, type.

RHIZOCARPON

RHIZOCARPON Ram. ap. Lamarck & DeCandolle, Fl. Franç. ed. 3. 2: 365. 1805.

Abacina Norm., Nyt. Mag. Naturvidensk. 7: 236. 1853.

Siegertia Koerber, Parerga Lich. 180. 1861.

Phalodictyum Clements, Gen. Fung. 77. 1909.

The type species is *Rhizocarpon geographicum* (L.) Ram. The type of *Abacina* is not designated but *Abacina amphibia* (Fr.) Norm. may be so considered. The type of *Siegertia* is *Lecidea calcarea* (Weis) Hepp. The type of *Phalodictyum* is *P. obscuratum* (Ach.) Clem.

Thallus crustose, uniform, with well-developed hypothallus; ecorticate; algae *Protococcus*. Apothecia sessile or immersed in the thallus; parathecium carbonaceous, rarely brown; hypothecium dark; thecium gelified, paraphyses branched; asci 1–8-spored; ascospores hyaline or finally brown, 2- or several-celled, becoming muriform by vertical septa, with a well-developed gelified sheath. Spermatia cylindric to acicular, straight or nearly so.

Zahlbruckner recognizes two subgenera which are often recognized as genera:

Catocarpus Koerber, Syst. Lich. Germ. 223. 1855 (as section of *Buellia).*

Catocarpus Arnold, Flora **54**: 147. 1871.

Rehmiopsis Müll. Arg., Flora **55**: 537. 1872 (as section of *Patellaria).*

Catocarpon Th. Fries, Lichenog. Scand. 612. 1874.

Diphaeis Clements, Gen. Fung. 77. 1909.

Diphanis Clements, Gen. Fung. 77. 1909.

The type species of *Catocarpus* Koerb., *Catocarpus* Arn., *Catocarpon* Th. Fr., and *Diphaeis* Clem. is *C. badioatrus* (Flk.) Arn. The type of *Rehmiopsis* is *Patellaria heterodoxa* Müll. Arg. The type of *Diphanis* is *D. polycarpa* (Hepp) Clem.

This subgenus or genus is separated on the basis of its two-celled spores and shows some transition to *Buellia*. Two species have been reported from the Graham Land Archipelago.

Eurhizocarpon Stzbgr. includes species with muriform spores.

KEY TO ANTARCTIC SPECIES

Spores 2-celled...CATOCARPUS
  Spores hyaline; thallus brownish or brownish gray, smooth, I blue. .*R. polycarpum*
  Spores brown; thallus brown, verrucose, I–...........*R. badioatrum* v. *Gerlachei*
Spores muriform...EURHIZOCARPON

Thallus pure white; medulla I– .... *R. argyreum*
Thallus yellowish.
Thecium more than 180 μ tall; paraphyses capitate, 4–6 μ.
Thecium 180–200μ; spores 25–43.7 × 16–18 μ; cortex 30–40 μ, with a hyaline zone 15 μ thick .... *R. geographicum*
Thecium 240 μ; spores 26–30 × 14–18 μ; cortex 20–30 μ, with a hyaline zone 20 μ .... *R. melanostictum*
Thecium 130 μ tall; paraphyses subcapitate, 2–3 μ; spores 27–34 × 12–15 μ; cortex 20–50 μ, with a hyaline zone 10 μ thick .... *R. nidificum*
Thecium 70–100 μ; paraphyses not capitate; spores 15–24.5 × 8–11 μ; cortex not differentiated .... *R. flavum*
Thallus ashy fuscous.
Ascospores 58–72 μ long, 2 per ascus .... *R. geminatum*
Ascospores (20–)33–38 μ long, 8 per ascus; thallus 0.2–0.6 mm. thick .... *R. griseolum*
Ascospores 28–30 μ long, 8 per ascus.
Thallus very thin, KC red .... *R. parapetraeum*
Thallus thick, verrucose, KC– .... *R. grande* v. *atrocaesium*

RHIZOCARPON **flavum** Dodge & Baker, sp. nov.

Pl. 43, figs. 88–93; pl. 44, figs. 94–97; pl. 65, fig. 426.

Type: Marie Byrd Land, Mt. Stancliff, *P. Siple & S. Corey 72A-2.*

Thallus crustosus, appressus, 2.2 cm. diametro vel 3 × 1.5 cm., non assimilans niger, carbonaceus, continuus, margine determinata centro subfuniculoso; areolae elevatae, saepe cellulis emortuis albis tectae; cortex superior 15 μ crassitudine, fastigiatus, cellulis obscure brunneis vel nigris, isodiametricis; medulla 120 μ crassitudine, hyphis hyalinis verticalibus laxissime implicatis; areolae assimilantes ad 1.5 mm. longitudine, 0.45 mm. altitudine, irregulares, saepe sinuosae vel angulares, dein repetito diffractae, pulvinatae, flavae, sine marginibus cellularum corticalium, floccosae; cortex superior non differentiatus; stratum gonidiale ad 140 μ crassitudine, protococcoideum, cellulis 9–16 μ diametro; medulla ad 200 μ, hyphis verticalibus subbrunneis; stratum basale plus minusve pseudoparenchymaticum, brunneum, ad 150 μ crassitudine.

Apothecia ad 0.9 mm. diametro, convexa vel subconcava, marginata, angularia, sparsa vel gregaria, singulariter in columnis nata, nigra, non nitida, juniora cellulis emortuis corticalibus equatorialibus ornata; parathecium non bene evolutum; hypothecium obscurum, hyphis periclinalibus dense compactum, 60–90 μ, ad marginem tenuescens; thecium 70–100 μ altitudine; paraphyses 1.5–3 μ diametro, ramosi vel non ramosi, septati, aetate obscurascens, gelifacti, pachydermatici, apicibus non capitatis, raro obscure callosis, epithecium 8–10 μ crassitudine efficientes; asci 53–80 × 16×30 μ, clavati, vaginati, gelifacti, raro angustiores longioresque, tum sporis monostichis; sporae octonae, (15)–17–24.5 × 8–14 μ, nigerrimae, uniseptatae dein muriformes, raro nonseptatae.

Thallus closely attached to the rock over areas up to 2.2 cm. in diameter or 3 × 1.5 cm.; non-assimilative areas black, carbo-

naceous, usually continuous, margin determinate but often separating into distinct strands toward the center of the fructification; pillars frequently covered with dead white cortical cells giving an areolate or reticulate appearance, sometimes especially pronounced in a zone just back of the pure black margin; upper cortex 15 μ thick, fastigiate, forming a pseudoparenchyma of dark brown or black cells; medulla 120 μ thick, of vertical hyphae loosely woven; assimilative areolae up to 1.5 mm. long and 0.45 mm. high, irregular in outline, often sinuous or angular, further separated by secondary cracks, usually very pulvinate, chartreuse yellow, not bordered with black cortical cells or only very slightly so, floccose; upper cortex evanescent or not differentiated, but cells slightly more compact; algal layer up to 140 μ thick, protococcoid, cells 9–16 μ in diameter; medulla up to 200 μ thick, of vertical hyphae rather loosely arranged, brownish basal layer more or less pseudoparenchymatous from periclinal brown hyphae, up to 150 μ thick.

Apothecia up to 0.9 mm. in diameter, convex or slightly concave with a marginal rim, frequently angled, scattered or gregarious, borne singly on the pillars, sessile or subsessile, dull black, never shiny, when young with an equatorial fringe of dead cortical cells; parathecium scarcely distinguishable except as a few cells, more closely united, extending in a thin line from the hypothecium to the exciple; hypothecium dark, of closely united periclinal hyphae, 60–90 μ, thinning toward the margin; thecium 70–100 μ tall; paraphyses 1.5–3 μ in diameter, branched or unbranched, septate, apparently becoming darker with age, with conspicuous gelified sheaths, heavy walls, not or only slightly expanded at the tips, occasionally with a dark cap, forming an epithecium 8–10 μ thick; asci 53–80 × 16–30 μ, large, bluntly clavate, 8-spored, with a moderately conspicuous gelified sheath, sometimes narrow and elongate with spores practically monostichous; ascospores (15)–17–24.5 × 8–14 μ, very dark, at first uniseptate, later muriform, sometimes remaining undivided.

On weathered biotite-sericite, sericite-orthoclase schist, and fine-grained dike.

MARIE BYRD LAND: Edsel Ford Range, Mt. Donald Woodward, *P. Siple, F. A. Wade, S. Corey & O. D. Stancliff DW-3, DW-4, DW-5*; Lichen Peak, *P. Siple & S. Corey 73-10*; Mt. Stancliff, *P. Siple & S. Corey 72A-1, 72A-2*, type.

ACAROSPORACEAE

Thallus little developed, crustose, squamulose or dwarf foliose, homoeomerous or heteromerous, attached to the substrate by the hyphae of the medulla or the prothallus or by a central strand in *Glypholechia*, without rhizinae; ecorticate or more or less corticate; with *Protococcus* algae. Apothecia immersed in thalline warts, sometimes nearly perithecioid, sessile or short-stipitate, single or crowded, with a circular or somewhat irregular disc, biatorine, lecideine, or lecanorine; asci polysporous; ascospores very small, usually unicellular, two-celled in *Maronea*, with thin walls and without sheaths.

Only *Acarospora*, thallus small, squamulose with small-celled pseudoparenchymatous cortex, apothecia immersed without a well-developed parathecium, has previously been found in Antarctica.

KEY TO ANTARCTIC GENERA

Parathecium highly developed.
  Apothecia biatorine with soft bright parathecium; epi- or endophloedal, saxicolous in Antarctica.......................................*Biatorella*
  Apothecia lecideine with carbonaceous parathecium.
    Apothecia immersed; thallus well developed; epilithic, Arctic, alpine.... ....*Sporostatia*
    Apothecia sessile or short-stalked; thallus poorly developed.........*Sarcogyne*
Parathecium absent...*Acarospora*

BIATORELLA

BIATORELLA DeNotaris, Giorn. Bot. Ital. II. 1[1]: 192. 1846.
Myrioblastus Trevisan, Linnaea **28**: 289. 1856.
Strangospora Koerber, Parerga Lich. 173. 1860.
Biatoridium Lahm. ap. Koerber, Parerga Lich. 172. 1860.

The type species is *Biatorella Roussellii* (Durieu & Montagne) DeNotaris. The type of *Myrioblastus* is *Lecidea fossarum* Dufour. The type of *Biatoridium* is *B. monasteriense* Lahm. The type of *Strangospora* is *S. pinicola* Koerber.

Thallus epi- or hypophloedal, or epilithic, crustose, uniform

or effigurate, attached to the substrate by hyphae of the prothallus or medulla; cortex absent or of irregularly woven hyphae; algae *Protococcus,* and arachnoid medulla. Apothecia circular, rarely irregular, immersed, sessile or very short-stalked, single; parathecium well developed above, absent below, disc smooth, verrucose or folded; hypothecium bright or dark; paraphyses slender, filiform, simple or seldom branched, persistent or evanescent; asci more or less clavate, polysporous; ascospores hyaline, unicellular, ellipsoidal or spherical, small, with a thin wall. Spermogonia immersed in the thallus or in thalline warts; spermatia ovoid or short-cylindric.

Biatorella **arachnoidea** Dodge & Baker, sp. nov.

Pl. 46, figs. 139–141.

Type: Marie Byrd Land, Edsel Ford Range, Skua Gull Peak, *P. Siple & S. Corey 72W-14.*

Thallus assimilans, 0.19–0.85 mm., arachnoideus, sparsus, ferrugineo-albus; algis ad 12 μ diametro, protococcoideis.

Apothecia 0.28–0.75 mm. diametro, parva, marginibus incurvis juventute, concava maturitate, pallido-flava; hypothecium hyalinum; thecium 35–40 μ altitudine; paraphyses 0.5–1.2 μ diametro, aequales, liberi, flexui, ramosi, frequenter sub apicibus bifurcati, non obscuri, cellulis longis, tenuibus, epithecium 10–15 μ, hyalinum; asci 34–40 × 20–21 μ, breves, late clavati, polyspori (30–50 per ascum), basi sine sporis; ascosporae 6–7.5 × 3–4 μ, ellipsoideae, apicibus obtusis vel subacutis, vaginatae.

All portions of the thallus assimilative, 0.19–0.85 mm., arachnoid, scattered, rusty white; algae up to 12 μ in diameter, protococcoid.

Apothecia 0.28–0.75 mm. in diameter, mostly small, with an inrolled margin when young, remaining more or less concave at maturity, pale yellowish; hypothecium hyaline; thecium 35–40 μ tall; paraphyses 0.5–1.2 μ in diameter, scarcely expanded at the tips, somewhat free and flexuous, branched, frequently bifurcate near the tip, not darkened on the outer surfaces, cells long, slender, epithecium 10–15 μ, hyaline; asci 34–40 × 20–21 μ, short and very broadly clavate with a small sheath, polysporous (30–50 per ascus), basal portion free from spores; ascospores 6–7.5 × 3–4 μ, ellipsoidal, ends blunt or somewhat pointed with a distinct halo.

On fine-grained dike in sedimentary rock.

Material of this species was very scant; only two apothecia were seen, of which one was mounted for study.

MARIE BYRD LAND: Edsel Ford Range, Skua Gull Peak, *P. Siple & S. Corey 72W-14.*

SARCOGYNE

SARCOGYNE Flotow, Bot. Zeit. 9: 753, 759. 1851.

Stereopeltis Franz. & DeNotaris, Comm. Soc. Crittogamol. Ital. 1[1]: 26. 1861.

Pleolecis Clements, Gen. Fung. 76. 1909.

The type species is *S. corrugata* Flotow. The type species of *Stereopeltis* is *S. macrocarpa* Franz. & DeNotaris. The type species of *Pleolecis* is *Lecidea geophana* Nyl.

Thallus poorly developed, epilithic, crustose; often ecorticate or with a poorly developed fastigiate cortex; algae *Protococcus;* medulla loosely woven without lower cortex. Apothecia sessile or short-stipitate, often somewhat elongate or angled, lecideine with a carbonaceous parathecium; hypothecium hyaline or brown; paraphyses slender, sometimes branched, gelified; asci polysporous; ascospores simple, ellipsoidal to spherical, small, thin-walled.

This genus is often considered a subgenus of *Biatorella*, from which it differs in its poorly developed, epilithic thallus and its lecideine, more or less angled, substipitate apothecia with highly developed parathecium. The thallus is often reduced to a small areole at the base of the apothecium.

No species have previously been reported from the Antarctic.

SARCOGYNE **angulosa** Dodge & Baker, sp. nov.

Pl. 46, figs. 127–132.

Type: Marie Byrd Land, Edsel Ford Range, Chester Mts., *P. Siple & S. Corey 97A-3.*

Thallus assimilans ad 0.09 mm. diametro, arachnoideus, delicatus, cremeus; cortex rarus, cellulis fastigiatis obscure brunneis fuscisve, superficie zona crystallorum ($CaCO_3$) 10–15 μ crassitudine; stratum gonidiale sparsum, cellulis protococcoideis ad 8 μ diametro; medulla ad 180 μ crassitudine, hyphis magnis irregu-

laribus leptodermaticis, ad 4 μ diametro, laxe subverticaliter dispositis; cortex inferus non evolutus.

Apothecia 0.08–0.4 mm. diametro, irregularia, ellipsoidea vel plus minusve rectangularia, marginata, sparsa caespitosave angulataque, nigra, nitida exsiccatione, margine nigra, disco rubro-brunneo madida; parathecium 10–30 μ crassitudine, basaliter tenuescens, paucis cellulis obscure fuscis isodiametricis, 2–3 × 10–13 μ, pachydermaticis; hypothecium ad 20 μ crassitudine, hyalinum, cellulis compactioribus; thecium 60–80 μ altitudine; paraphyses 0.5–1.0 μ diametro, apicibus ad 4 μ diametro, flexuosi, ramosi, obscuri, epithecium 10–15 μ, gelifactum carbonaceumve; asci 64–81 × 15–24 μ, polyspori, late clavati insuper, subtus tenuescentes, sporis tote impleti; ascosporae 2.2–3.5 ×1.1–2.0 μ, ovoideae, halone inconspicuo.

Non-assimilative portion absent; assimilative portions up to 0.09 mm. in diameter, arachnoid, scantily spread over the rock, very delicate and limited to the basal portions of the apothecia, cream-white; cortex scantily represented by occasional groups of dark brown to fuscous fastigiate cells, the outer surface covered more frequently by a zone of crystalline deposits ($CaCO_3$) 10–15 μ thick; algae protococcoid, up to 8 μ in diameter, relatively few in small scattered groups; medulla up to 180 μ thick, of large irregular thin-walled hyphae up to 4 μ in diameter, loosely and more or less vertically arranged; basal cortex not differentiated.

Apothecia 0.08–0.4 mm. in diameter, irregularly circular or elliptic to more or less rectangular with distinct margin, scattered or closely clustered and then angled by mutual pressure, black, shining when dry, the margin black, the disc dull reddish brown when moistened; parathecium 10–30 μ thick, well developed laterally, thinning below to a few dark fuscous isodiametric cells, 2–3 × 10–13 μ, the outermost rows darkened and thick-walled; hypothecium about 20 μ thick, of more compact cells, hyaline, merging laterally into the parathecium; thecium 60–80 μ tall; paraphyses 0.5–1.0 μ in diameter, expanding at the tips to heads up to 4 μ, flexuous, branched, darkened on the outer surfaces, epithecium 10–15 μ, dark, gelified to carbonaceous; asci 64–81 × 15–24 μ, polysporous, broadly clavate above, slender below, entirely filled with spores from tip to base; ascospores 2.2–3.5 × 1.1–2.0 μ, ovoid, with a faint scarcely distinguishable halo.

On highly metamorphosed quartzitic rock.

MARIE BYRD LAND: Edsel Ford Range, Chester Mts., *P. Siple & S. Corey 97A-3*, type.

SARCOGYNE **grisea** Dodge & Baker, sp. nov.

Pl. 46, figs. 133–138.

Type: Marie Byrd Land, Edsel Ford Range, Lichen Peak, *P. Siple & S. Corey 73-1.*

Pars non assimilans funiculis irregularibus nigris; pars assimilans floccis sparsis vel areis compactioribus 2 × 3 mm., albida vel grisea, ecorticata; algae ad 10 μ, protococcoideae, rarae, sparsae; medulla laxe filamentosa; cortex inferior deest.

Apothecia ad 0.45 mm. diametro, irregulariter circularia, concava, marginata, nigra, nitida vel non, sessilia, sparsa, singula aut gregaria coacervataque; parathecium 30– 80 μ crassitudine, pseudoparenchymaticum, fuscum vel dilute brunneum, irregulariter sub thecium 100–200 μ percurrens; thecium circa 100 μ altitudine; paraphyses 1–1.5 μ diametro, graciles, flexuosi, simplices vel ramosi, non capitati, evaginati, non obscuri, epithecium 10–20 μ, hyalinum; asci 58–66 × 21–26 μ, late clavati, sporis impleti, polyspori, vagina 18 μ apice crassitudine; ascosporae 2–2.5 × 0.5–1.5 μ, hyalinae, ovoideae ellipsoideaeve.

Non-assimilative portion confined to a few short irregular black strands below the assimilative portions which range from fragmentary bits to more compact areas 2 × 3 mm., white to grayish, not corticate; algae up to 10 μ, protococcoid, rare, scattered; medulla of loose filamentous hyphae; lower cortex not differentiated.

Apothecia up to 0.45 mm. in diameter, irregularly circular, very concave, marginate, black, shining or dull, sessile, scattered and single or gregarious and heaped; parathecium 30–80 μ thick, pseudoparenchymatous, fuscous to light brown, irregularly extending below the thecium 100–200 μ; thecium about 100 μ tall; paraphyses 1–1.5 μ in diameter, slender, flexuous, branched or not, without a prominent sheath, not much expanded at the tips nor darkened, epithecium 10–20 μ, hyaline; asci 58–66 × 21–26 μ, broadly clavate and completely filled with spores, polysporous, with a conspicuous sheath up to 18 μ thick at the apex; ascospores 2–2.5 × 0.5–1.5 μ, hyaline, ovoid to ellipsoidal.

On erratic pink granite and sericite-orthoclase schist.

MARIE BYRD LAND: Edsel Ford Range, Lichen Peak, *P. Siple & S. Corey 73-1*; Mt. Stancliff, *P. Siple & S. Corey 72A-1.*

UMBILICARIACEAE

Thallus foliose, mono- or polyphyllous, attached to the substrate by a central strand, heteromerous, under-side often rhizinose, corticate on both surfaces; medulla loose, algae *Protococcus*. Apothecia appressed, sessile or almost stalked; amphithecium rarely present; parathecium carbonaceous, usually well developed, with a loose medulla below, sometimes with a few algae, disc folded, seldom smooth; asci 1–8-spored; spores hyaline or dark, unicellular, several-celled to muriform with a thin wall.

The division of this family into genera and smaller subdivisions presents serious problems. Zahlbruckner recognizes five genera as in the following key. Frey would unite *Gyrophora* and *Umbilicaria*. Scholander would recognize *Umbilicaria* and *Gyrophora* with different characters than those used by Zahlbruckner, and would segregate two others. Since most of our Antarctic material is sterile, we have referred it to *Umbilicaria*, the oldest name in the group, without attempting to reach a decision on the three current classifications of this family. *Charcotia* Hue is endemic in the Antarctic.

The systematic position of *Omphalodium* has long been debated. It is usually placed in the Parmeliaceae on the basis of a lecanorine apothecium. The presence of a lecanorine apothecium in *Charcotia* and *Dermatiscum* of the Umbilicariaceae seems to warrant the inclusion of *Omphalodium* in this family. When sterile, it would be looked for here.

KEY TO ANTARCTIC GENERA (after Zahlbruckner)

Apothecia lecideine.
- Spores unicellular, often brown in age; asci 8-spored.............. *Gyrophora*
- Spores muriform, brown; asci 1–2-spored........................ *Umbilicaria*

Apothecia lecanorine; asci 8-spored.
- Spores unicellular .... *Omphalodium*
- Spores 2-locular.
  - Spores hyaline.. *Charcotia*
  - Spores brown.. *Dermatiscum*

UMBILICARIA

UMBILICARIA Hoffm., Desc. Adumb. Pl. . . . Lich. 1: 9. 1789.

Two type species were recognized in Hoffmann's first treatment: *U. exasperata* treated by Zahlbruckner as a variety of *Gyrophora proboscidea,* and *U. cirrosa,* both in *Gyrophora* sect. *Eugyrophora.*

Thallus foliose, mono- or polyphyllous, attached to the substrate by a central strand, heteromerous, under-side smooth or hirsute; upper cortex pseudoparenchymatous, commonly covered by a much thinner, amorphous layer; algae protococcoid; medulla arachnoid, lower cortex pseudoparenchymatous, sometimes from a palisade of hyphae with isodiametric cells. Apothecia lecideine, disc smooth or papillate or gyroseplicate; asci 1-, 2-, or 8-spored, ascospores 1-, 2-celled or muriform, hyaline or brown. Spermogonia papillate, immersed, with black tips, spermatiophores branched; spermatia short to cylindric.

KEY TO SPECIES REPORTED FROM THE ANTARCTIC

Without rhizinae below.
- White or pale below, dark above with pale margins; apothecia lecanorine; ascospores unicellular.............................*Omphalodium quartum*
- Dark below.
  - Areolate-verrucose below; monophyllous..........................*U. rigida*
  - Glabrous or rarely white-granular below.
    - Polyphyllous; upper cortex 20–40 μ thick, black to ashy with white globules; fuscous below.................................*U. parvula*
    - Monophyllous.
      - Upper cortex rimulose-areolate, ashy pruinose; below black with pale margins.....................................*U. leiocarpa* v. *nana*
      - Upper cortex reticulate-rugose.
        - Upper cortex 150 μ, with fine rimose areolae, dark gray or brown; below black with paler margins....................*U. decussata*
        - Upper cortex 80 μ, black with white hemispheric or flattened warts; below fuscous.................................*U. eximia*
        - Upper cortex 10–15 μ, deep olive buff shading to dark olive gray at the margins; below black.............................*U. rugosa*
      - Upper cortex cerebriform-rugose, 20 μ, minutely rimose-areolate, between Naples yellow and olive buff, darkening; below light ochraceous buff, darkening............................*U. cerebriformis*
      - Upper cortex smooth, minutely areolate, 20 μ, chamois to olive buff, darkening; below blackening.....................*U. pateriformis*

With rhizinae below; monophyllous.
- Pale below; ashy pruinose above with black marginal rhizinae.....*U. cylindrica*
- Fuscous below; ashy pruinose above with tufts of marginal rhizinae..*U. cristata*

Black below.

Upper cortex gray to chocolate brown, rimose-areolate, 30–40 μ thick; apothecia lecideine; spores unicellular, 8–12.5 × 5.3–8 μ........*U. vellea*

Upper cortex bay becoming bay fuscous near the margins, slightly rimulose-areolate..*U. Dillenii* v. *solida*

Upper cortex ashy rufidulous, 40–100 μ thick, smooth, very slightly rugulose under lens; apothecia lecanorine; spores 2-celled, 12–14 × 4–5 μ ....*Charcotia rufidula*

Upper cortex mummy brown to light buff, 20–25 μ thick, deeply reticulate-rugose, slightly rimulose-areolate in center, otherwise not cracked; rhizinae not concrescent in trabeculae...................*U. spongiosa*

OMPHALODIUM **quartum** (Darbishire) Dodge & Baker, comb. nov.

Parmelia quarta Darbishire, Nat. Antarct. [Discovery] Exp. Nat. Hist. Lichenes **5**: 6. 1910.

UMBILICARIA **rugosa** Dodge & Baker, sp. nov.
Pl. 44, figs. 98–104; pl. 63, figs. 414, 416.

Type: King Edward VII Land, Rockefeller Mts., Mt. Helen Washington, *P. Siple, F. A. Wade, S. Corey & O. D. Stancliff HW-12.*

Thallus monophyllus, 8–9 cm. diametro, reticulatim scrobiculosus, centro olivaceo-alutaceus, marginibus obscure olivaceo-griseis, crenulatis, tenuissimis, fragilibus, non laciniatus, subtus niger, minute floccosus vel pruinosus, laevis, sine rhizinis, ad umbilicum non rugosus; cortex superior 10–15 μ crassitudine, cellulis magnis isodiametricis, exteris obscuris, interis hyalinis, strato ad 25 μ crassitudine cellularum emortuarum tectus; stratum gonidiale 20–65 μ crassitudine, cellulis ad 10 μ diametro, protococcoideis; medulla 200–300 μ crassitudine, hyphis 2–4 μ diametro, pachydermaticis, laxe implexis, ramosis anastomosantibusque, cellulis brevibus; cortex inferior ad 40 μ crassitudine, pseudoparenchymaticus, obscurus, sine cellulis emortuis.

Apothecia ad 2 mm. diametro, irregularia, gyrosa, fusca nigrave, non nitida; parathecium ad 25 μ crassitudine, fuscum, cellulis pachydermaticis isodiametricis; medulla hyphis laxe implexis; hypothecium ad 150 μ crassitudine, obscurum, irregulare; thecium 50–80 μ altitudine; paraphyses 1 μ diametro, vaginati, simplices ramosive, septati, capitibus 1.5–2 μ diametro, epithecium 10–13 μ crassitudine, gelifactum, brunneum; asci (37–)39–46 × 11–13.5 μ, late clavati insuper, gracillimi subtus, vagina tenui; ascosporae octonae, 7.5–9 × 3–4 μ, ellipsoideae, apicibus obtusis, hyalinae.

Thallus monophyllous, 8–9 cm. in diameter, upper surface deeply and coarsely reticulate-scrobiculate, folds closer and pits shallower near the margin, center deep olive buff, margins dark olive gray, crenulate, very thin and fragile, not laciniate, below black, dull, appearing minutely cottony or pruinose,

smooth, without rhizinae, not folded at the umbilicus; upper cortex 10–15 μ thick, of large isodiametric cells, very dark on the outside, hyaline within, covered by a layer of dead cells up to 25 μ thick; algal layer 20–65 μ thick, cells up to 10 μ, protococcoid; medulla 200–300 μ thick, of thick-walled hyphae 2–4 μ in diameter with rather short cells loosely interwoven, branched, and anastomosed; lower cortex up to 40 μ thick, pseudoparenchymatous, dark, without a layer of dead cells at the surface.

Apothecia up to 2 mm. in diameter, irregular, gyrose, fuscous to black, dull; parathecium up to 25 μ thick, fuscous, cells isodiametric, thick-walled, continuous laterally with the thalline cortex; medulla of loosely woven hyphae; hypothecium up to 150 μ thick, dark, irregular; thecium 50–80 μ tall; paraphyses 1 μ, expanding to heads 1.5–2 μ in diameter, with a sheath, straight or branched, septate, epithecium 10–13 μ, gelified, brown; asci (37–)39–46 × 11–13.5 μ, clavate above and very slender below, with a thin sheath, 8-spored; ascospores 7.5–9 × 3–4 μ, ellipsoidal, mostly with blunt ends, hyaline.

On orthoclase-sericite-siderite schist, coarse pink granite, fine-grained dike, and weathered dike of porphyritic diabase.

King Edward VII Land: Rockefeller Mts., Mt. Helen Washington, *P. Siple, F. A. Wade, S. Corey & O. D. Stancliff HW-12*, type, *HW-13, HW-14, HW-15.*

Marie Byrd Land: Edsel Ford Range, Skua Gull Peak, *P. Siple & S. Corey 72W-13, 72W-14, 72W-15, 72W-16;* Mt. Grace McKinley, *P. Siple, F. A. Wade, S. Corey & O. D. Stancliff McK-2, McK-3, McK-6, McK-10.*

Umbilicaria **cerebriformis** Dodge & Baker, sp. nov.

Pl. 45, figs. 107–110; pl. 63, fig. 412.

Type: Marie Byrd Land, Edsel Ford Range, Skua Gull Peak, *P. Siple & S. Corey 72W-15.*

Thallus monophyllus, ad 2.5 cm. diametro, rugosus cerebriformisque, minute areolatus, marginibus crispatis, elevatis, subpruinosis, flavus neapolitanus aut olivaceo-alutaceus, nigricans, subtus laevis, dilute ochraceo-alutaceus, nigricans, sine rhizinis; cortex superior ad 20 μ crassitudine, subfastigiatus, decompositus pseudoparenchymaticusve, non obscurascens, cellulis 3–4 μ diametro, laxe dispositis, strato gelifacto ad 60 μ crassitudine, fracto tectus; stratum gonidiale 40–50 μ crassitudine, 25–60 μ sub cortice, cellulis protococcoideis, ad 9 μ diametro, in coloniis parvis; medulla frequenter 140–175 μ crassitudine aut ad 400 μ, hyphis 2–4 μ diametro, ramosis anastomosantibusque, verticaliter super algas dispositis, et densius periclin-

alibus in strato 30–40 μ crassitudine ad corticem inferiorem; cortex inferior 30–40 μ crassitudine, pseudoparenchymaticus, obscurus.

Apothecia juvenilia, nigra, sessilia subimmersave; cortex 35 μ, fastigiatus intus cortici thallino similis, hyphis cellulis isodiametricis nigris, 15 μ diametro terminatis; parathecium tenue, hyalinum, hyphis tenuibus dense compactis; hypothecium circa 60 μ crassitudine; thecium circa 60 μ altitudine; paraphyses tenues, 1 μ diametro; asci juveniles clavati, vaginati.

Spermogonia ampulliformia juventute, dein applanata irregulariaque, ostiola parva; murus carbonaceus, niger, cellulis parvis isodiametricis; spermatiophorae flexuosae, tenues, septatae; spermatia bacilliformia, recta, brevia.

Thallus monophyllous, up to 2.5 cm. in diameter, surface rugose to cerebriform, minutely areolate, elevated and coarsely crenulate, subpruinose, between Naples yellow and olive buff, darkening; lower surface smooth, light ochraceous buff, blackening, without rhizinae; upper cortex about 20 μ thick, subfastigiate, decomposed to pseudoparenchymatous but not darkened except occasionally when the outer cell-walls are slightly so, cells 3–4 μ in diameter, loosely arranged, covered by a gelified layer up to 60 μ thick, cracked into areoles of very unequal size; algal layer 40–50 μ thick, 25–60 μ below the upper cortex, cells up to 9 μ in diameter, protococcoid, more or less grouped in small colonies; medulla commonly 140–175 μ thick but expanding to 400 μ, of hyphae 2–4 μ in diameter, branched and anastomosed, vertical and branched above the algal layer, irregularly interwoven in the central portion, fibrous and dense for 30–40 μ next the lower cortex which is 30–40 μ thick, dense, pseudoparenchymatous, mostly very dark, sometimes without color.

Apothecia very young, black, sessile to somewhat immersed; cortex 35 μ, fastigiate, inner portion similar to that of the thallus, hyphae ending in thick-walled black cells about 15 μ thick which extend over the disc at this stage; parathecium thin, hyaline, of slender, densely woven hyphae; hypothecium about 60 μ thick, very deeply staining; thecium about 60 μ tall; paraphyses slender, about 1 μ in diameter; young asci clavate with a gelified sheath, filled with deeply staining protoplasm.

Spermogonia flask-shaped when young, becoming flattened and irregular with a small ostiole; wall carbonaceous, black, of small-celled pseudoparenchyma; spermatiophores flexuous,

slender, closely septate; spermatia bacilliform, straight, short. The old spermogonia are frequently invaded by hyphae of *Hormiscium*.

On quartzite and granite, leuco-sodaclase granodiorite, porphyritic diabase, and crypto-crystalline pink granite.

King Edward VII Land: Rockefeller Mts., Mt. Helen Washington, *P. Siple, F. A. Wade, S. Corey & O. D. Stancliff HW-10, HW-11, HW-12a, HW-13.*

Marie Byrd Land: Edsel Ford Range, Skua Gull Peak, *P. Siple & S. Corey 72W-15*, type; Mt. Grace McKinley, *P. Siple, F. A. Wade, S. Corey & O. D. Stancliff McK-6, McK-8.*

Umbilicaria **pateriformis** Dodge & Baker, sp. nov.
Pl. 44, figs. 105–106.

Type: Marie Byrd Land, Edsel Ford Range, Skua Gull Mt., *P. Siple & S. Corey 72W-13.*

Thallus monophyllus, ad 1 cm. diametro, laevis, minute areolatus, marginibus laevibus aut sublaceratis, fragilibus, olivaceo-alutaceus, nigricans, subtus niger, laevis, sine rhizinis; cortex superior circa 20 μ crassitudine, cellulis 4–5 μ, isodiametricis, strato ad 20 μ crassitudine gelifacto diffracto tectus; stratum gonidiale 15–25 μ crassitudine, 20–40 μ sub cortice superiori, cellulis ad 9 μ diametro, protococcoideis; medulla 90–125 μ crassitudine, hyphis tenuibus circa 0.75 μ diametro, ramosis anastomosantibusque, super algas verticaliter, sub algis irregulariter contextis et ad corticem inferiorem periclinaliter dispositis; cortex inferior circa 20 μ crassitudine, cellulis 4–7 μ diametro, isodiametricis, pachydermaticis, nigris. Sterilis.

Thallus monophyllous, up to 1 cm. in diameter, surface smooth, minutely areolate, margin smooth, occasionally somewhat lacerate, rather fragile, between chamois and deep olive buff, blackening, below smooth, black, without rhizinae; upper cortex about 20 μ thick, pseudoparenchymatous to fastigiate, cells 4–5 μ in diameter, covered with a broken gelified layer up to 20 μ thick; algal layer 15–25 μ thick, 20–40 μ below the upper cortex, cells up to 9 μ in diameter, protococcoid; medulla 90–125 μ, of slender hyphae about 0.75 μ in diameter, branched and anastomosed, regular and vertical above the algal layer, irregularly woven below and becoming periclinal next the lower cortex which is about 20 μ thick, cells 4–7 μ, isodiametric, thick-walled, dark, much denser than the upper cortex. Apothecia not seen.

We have hesitated to describe this as a distinct species, since

it is sterile and small. It may be only a juvenile stage of *U. cerebriformis,* yet many small thalli of the latter show the beginning of the wrinkling and folding of the upper surface before they have reached the diameter of this. Microscopically they are somewhat similar. Some of the material cited from King Edward VII Land is lighter and some darker than the type.

On granite and fine-grained dike.

KING EDWARD VII LAND: Rockefeller Mts., Mt. Helen Washington, *P. Siple, F. A. Wade, S. Corey & O. D. Stancliff HW-13.*

MARIE BYRD LAND: Edsel Ford Range, Skua Gull Peak, *P. Siple & S. Corey 72W-13,* type.

UMBILICARIA **cristata** Dodge & Baker, sp. nov.

Pl. 45, figs. 122–126.

Type: King Edward VII Land, Rockefeller Mts., Mt. Helen Washington, *P. Siple, F. A. Wade, S. Corey & O. D. Stancliff HW-1a.*

Thallus monophyllus, 2–3 cm. diametro, laevis aut centro verrucosus rugosusque, marginibus sublaceratis, rhizinosis, fragilis siccatus, cinereo-pruinosus, centro minute rimuloso-areolato, subtus fuscus marginibus dilutioribus; rhizinae cylindricae, ramosae, apicibus ramisque cinereis; cortex 5–10 μ crassitudine, pseudoparenchymaticus, cellulis 3–5 μ diametro, exteris obscuris, strato 3–6 μ crassitudine cellularum emortuarum tectus; algae ad 10 μ diametro, protococcoideae, sub cortice superiore sparsae; medulla 140–150 μ crassitudine, hyphis 2–3 μ diametro, ramosis anastomosantibusque, insuper reticulatim, subtus periclinaliter dispositis; cortex inferior 30–40 μ crassitudine, pseudoparenchymaticus, cellulis exteris obscuris; rhizinae hyphis periclinalibus cum cortice pseudoparenchymatico; stipes irregularis, 1.5–2.5 mm. diametro, cavitate centrali 1 mm. diametro; cortex obscurus, medulla hyalina, cellulis compactis verticalibus, sine algis.

Thallus monophyllous, 2–3 cm. in diameter, surface smooth or verrucose and rugose near the center, margin somewhat lacerate with dense tufts of rhizinae, very brittle when dry, ashy pruinose, minutely rimulose-areolate, especially toward the center, below fuscous, margins lighter with occasional cylindrical branched rhizinae, tips and branches ashy; upper cortex 5–10 μ thick, of loose pseudoparenchyma, the cells 3–5 μ in diameter, outer ones dark, the whole covered by an irregular layer of dead cells 3–6 μ thick; algae up to 10 μ in diameter, protococcoid, scattered near the cortex; medulla 140–150 μ thick, of branched and anastomosing hyphae 2–3 μ in diameter, loosely

reticulate above, more or less periclinal near the lower cortex which is 30–40 μ thick, dark on the outside, hyaline within, pseudoparenchymatous; rhizinae dark with a pseudoparenchymatous cortex continuous with that of the thallus and with periclinal hyphae within; stipe very irregular in cross-section, 1.5–2.5 mm. in diameter with a central opening 1 mm. in diameter; cortex dark, medulla hyaline, of compact vertical cells. In longitudinal section the compact basal portion pseudoparenchymatous, the fibrous vertical tissue 14–20 μ thick, the cells 1–3 μ in diameter, and a dark cortex on the outside with no cortex on the inside. Sterile.

On coarse-grained granite.

KING EDWARD VII LAND: Rockefeller Mts., Mt. Helen Washington, *P. Siple, F. A. Wade, S. Corey & O. D. Stancliff HW-1a*, type.

UMBILICARIA **spongiosa** Dodge & Baker, sp. nov.

Pl. 45, figs. 111–121.

Type: Marie Byrd Land, Edsel Ford Range, Lichen Peak, *P. Siple & S. Corey 73-9.*

Thallus monophyllus, ad 15 cm. diametro, fragilis, profunde reticulatimque rugosus, centro verrucosus ad margines laevior impressusque, marginibus laevibus, crispatis, non laceratis, coriaceus, obscure brunneus vel ravus, pruinosus, centro subareolato, subtus sepiaceus, laevis, dense rhizinosus; rhizinae sepiaceae ad thallum, dilutiores ad apices, subramosae, cylindricae, non in trabeculis anastomosantes; cortex superior 20–25 μ crassitudine, cellulis pachydermaticis, 2–3 μ diametro, pseudoparenchymaticus, strato 2–4 μ crassitudine cellularum emortuarum tectus; stratum gonidiale ad 75 μ crassitudine, cellulis protococcoideis, ad 12 μ diametro; medulla 250–400 μ crassitudine, hyphis 2.5–3 μ diametro, irregulariter dispositis; cortex inferior 10–20 μ crassitudine, cellulis exteris pachydermaticis, obscuris, isodiametricis; rhizinae hyphis ramosis, tenuibus, raro anastomosantibus, cortice pseudoparenchymatico, circa 10 μ crassitudine tectae; stipes 1.5–2 mm., cavitatibus centralibus aut lateralibus, cortex fuscus irregularis, pseudoparenchymaticus; medulla hyphis densissimis contexta, sine algis.

Spermogonia 400 μ altitudine, 325 μ diametro ad basim, ad ostiolam tenuescens, ostiola circa 150 μ diametro; murus cellulis obscuris compactis, 5–7 μ diametro; spermatiophorae ramosae, 1 μ diametro, apicibus attenuatis; spermatia 1 × 0.5 μ, recta.

Thallus monophyllous, up to 15 cm. in diameter (greatly broken in transit, fragments 5–6 cm.), surface deeply reticulate-rugose and verrucose in center, smoother and only impressed at margin which is smooth, not torn, and very much crisped, leathery when dry, mummy brown to light buff, prui-

nose, very slightly areolate in center, otherwise not cracked, below sepia, smooth, very densely rhizinose; rhizinae sepia next the thallus, becoming pale pinkish buff toward the tips, sparingly branched, cylindric, not anastomosing into trabeculae; upper cortex 20–25 μ thick, surface very uneven, cells thick-walled, 2–3 μ in diameter, isodiametric, not darkened, the whole covered by a layer of dead cells 2–4 μ thick or lacking entirely; algal layer up to 75 μ thick, cells up to 12 μ in diameter, protococcoid; medulla 250–400 μ thick, of hyphae 2.5–3 μ in diameter, irregularly arranged, often somewhat periclinal next the lower cortex which is 10–20 μ thick, the outer cells isodiametric, thick-walled, dark; rhizinae of slender branched, rarely anastomosed hyphae, covered with a pseudoparenchymatous cortex about 10 μ thick; stipe central, 1.5–2 mm. in diameter, in section irregular in outline with small openings either central or lateral, of compact hyphal tissue covered both externally and internally by a dark irregular pseudoparenchymatous cortex, without algae.

Spermogonia 400 μ tall, 325 μ in diameter at the base, tapering to a narrower neck, about 150 μ in diameter; the wall of compact dark cells 5–7 μ in diameter; spermatiophores branched, about 1 μ in diameter, tapering at the ends; spermatia 1 × 0.5 μ, straight.

On sericite-orthoclase schist or on sandy loam.

MARIE BYRD LAND: Edsel Ford Range, Lichen Peak, *P. Siple & S. Corey 73–9*, type; Skua Gull Peak, *P. Siple & S. Corey 72W-1, 72W-15.*

LECANORACEAE

Thallus crustose, uniform or with effigurate margins, rarely dwarf-fruticose, branched, attached to the substrate by the hyphae of the prothallus or of the medulla, without rhizinae, heteromerous except in *Harpidium*; ecorticate or corticate; with *Protococcus*. Apothecia immersed in the thallus or sessile, round; amphithecium well developed; parathecium poorly developed or lacking; hypothecium hyaline, usually with algae below; paraphyses unbranched and free or branched and intricate; asci 8–32-spored; spores hyaline, rarely brownish, uni-

cellular, 2 or more celled or muriform and many-celled, thin-walled.

KEY TO ANTARCTIC GENERA

Spores unicellular; paraphyses unbranched and free.
Thallus gray or white...*Lecanora*
Thallus not effigurate; no parathecium.
Apothecia immersed, concave...*Aspicilia*
Apothecia sessile...*Eulecanora*
Thallus effigurate; parathecium often highly developed but algal layer under the hypothecium.
Cephalodia absent.
Apothecia sessile; alpine, Arctic and Antarctic..............*Squamaria*
Apothecia immersed; Kerguelen Island....................*Urceolina*
Cephalodia present.
Apothecia sessile; Arctic, alpine............................*Placopsis*
Apothecia immersed, disc concave........................*Aspiciliopsis*
Thallus dwarf-fruticulose; California..........................*Cladodium*
Thallus bright yellow...*Candelariella*
Spores uniseptate (rarely pluriseptate); paraphyses unbranched and free.
Thallus gray or brown...*Lecania*
Thallus crustose...*Eulecania*
Thallus squamulose...*Solenospora*
Thallus fruticulose...*Thamnolecania*
Thallus bright yellow...*Candelariella*

LECANORA

LECANORA Acharius, Lichenogr. Univ. 77. 1810.

The type species is not designated.

Thallus crustose, uniform or effigurate or squamose and small-foliose, seldom dwarf-fruticose, attached to the substrate by the hyphae of the hypothallus or of the medulla, without rhizinae, heteromerous; ecorticate or corticate; algae *Protococcus*. Apothecia immersed or sessile, circular; amphithecium well developed; parathecium usually absent or poorly developed, rarely well developed; paraphyses unbranched, free; hypothecium hyaline or colored; asci normally 8-spored, rarely 16–32-spored; ascospores hyaline, ellipsoidal, elongate to spherical, rarely kidney-shaped, thin-walled without a sheath. Spermatia bacilliform, cylindric or filiform, straight or curved.

The characters of the sections which are often recognized as genera are given above in the Key to the Genera.

KEY TO ANTARCTIC SPECIES OF OCHROLECHIA AND LECANORA

Spores large, often less than 8 per ascus; paraphyses conspicuously and intricately branched, forming an epithecium 40 μ or more thick.....*Ochrolechia*
Spores 44–76 × 30–40 μ; asci 256 × 70 μ, 4-spored..............*O. Deceptionis*
Spores 22–40 × 18–26 μ; asci 180 × 50 μ, 6-8-spored..................*O. frigida*
Spores much smaller, 8 per ascus; paraphyses simple or sparingly branched near the tip, forming a much thinner epithecium..................*Lecanora*
Thallus effigurate to squamulose................................SQUAMARIA
Apothecia adnate; thallus white-virescent..................*L. Babingtonii*
Apothecial stalk highly developed, often appearing subpodetiiform.
Apothecial margin yellowish ashy, crenulate, lobed, gemmiferous; thallus yellowish ashy..............................*L. Daltoniana*
Apothecial margin ochraceous buff to light ochraceous buff, crenulate, not lobed, smooth; thallus light ochraceous buff...........*L. exsulans*
Apothecial margin deep olive buff, smooth; thallus smoke gray to drab ....*L. Siplei*
Thallus crustose..EULECANORA
Thallus microphylline with ascending narrow laciniae.
Laciniae 1–1.5 mm. long, black variegated, cortex 20 μ, fastigiate; apothecia 0.3–0.8 mm. in diameter...................*L. leucomelaena*
Laciniae 6–7 mm. long, white straw color, cortex 30–60 μ, decomposed; apothecia 1–5 mm. in diameter......................*L. Charcotiana*
Thallus uniform, granulose, verrucose, or areolate.
Spores 12–22 × 7–12 μ.
Thallus white to greenish ashy; apothecia 1–2 mm...........*L. subfusca*
Thallus rufescent; apothecia 0.75 mm., subimmersed; paraphyses corymbose-branched................................*L. alutacea*
Spores usually less than 15 × 8 μ.
Thallus yellowish to greenish citrine.
Thallus sorediose....................................*L. orostheoides*
Thallus not sorediose.
Epithecium dark.
Thecium 60 μ; spores 10–15 × 5–5.5 μ.................*L. humillima*
Thecium 80–90 μ; spores 7–11 × 5–7 μ.................*L. Gainiana*
Epithecium pale.
Thallus 2.5 mm. thick, rimose-rugose; thecium 120–140 μ...... ....*L. miranda*
Thallus thinner.
Apothecia 0.5–1.0 mm.; thallus inconspicuous......*L. Mons-Nivis*
Apothecia larger.
Apothecia substipitate.......................*L. aspidophora*
Thallus reduced; disc black, KOH green.........v. *aterrima*
Thallus granulose, verrucose, warts 1–3 mm., KOH yellow; disc reddish-flesh color, KOH–, apothecial stipe 1.5–3 mm.......................................v. *errabunda*
Thallus verrucose, warts 2–4(–6) mm., KOH–; disc pale straw, KOH–, apothecial stipe 1–1.5 mm........v. *typica*

Apothecia sessile.................................*L. polytropa*
Spores 12–13 × 6–8 μ; apothecia pale.........v. *leptacinoides*
Spores 10–13 × 4–5 μ.
Apothecia pale, thalline warts and areoles small, usually dispersed.................................v. *illusoria*
Apothecia often blackened, areoles and warts usually contiguous.................................v. *intricata*
Thallus white.
Hypothecium and paraphyses violet purple...........*L. atra* v. *vulgaris*
Hypothecium and paraphyses hyaline or nearly so.
Thallus thin, tartareous to obsolete......................*L. expectans*
Thallus smooth, areolate; disc fuscous black.
Apothecia 0.4–0.8 mm..............................*L. tephroecета*
Apothecia 1–3 mm..................................*L. dancoensis*
Apothecia simple..................................f. *normalis*
Apothecia proliferous.............................f. *prolifera*
Thallus granulose to verrucose.
Apothecia 0.5–1.0 mm., margin white, lobulate.......*L. margaritae*
Apothecia 1–2 mm., margin fuscous...................*L. epibryon*
Thallus gray.
Apothecia 0.5 mm.; thalline warts 2–3(–5) mm........*L. poliophaeoides*
Apothecia 1–1.2 mm.; thallus powdery, granular.
Spores 10–12 × 4–5 μ, margin white; thallus very inconspicuous, saxicolous.......................................*L. lavae*
Spores 8.5–12.5 × 5–6 μ, margin gray; thallus granular, rugose, muscicolous.................................*L. griseomarginata*
Thallus lilac to lilac fuscous, ecorticate.
Apothecia 1.2 mm.; spores 8–10 × 4–6 μ.....................*L. lilacina*
Apothecia 0.65 mm.; spores 11.5–13 × 4.5–5.5 μ.........*L. lilacinofusca*
Thallus olive buff or brownish, corticate.
Apothecia usually over 1 mm.; spores 10–16 × 4–6 μ...........*L. badia*
Apothecia under 0.8 mm.
Spores 9–11 × 4–4.5 μ; medulla 50–60 μ...............*L. carbonacea*
Spores 13–15 × 4–6.5 μ; medulla 300 μ.
Apothecia 0.4 mm.; asci 46–48 × 12.5–14 μ; young spores appendiculate.................................*L. fuscobrunnea*
Apothecia 0.75 mm.; asci 58–61 × 14–15 μ, young spores not appendiculate.................................*L. subolivacea*

LECANORA **exsulans** (Th. Fries) Dodge & Baker, n. comb.

Lecanora chrysoleuca (Smith) Acharius var. *melanophthalma* (Ram.) Th. Fries, f. *exsulans* Th. Fries, Nyt Mag. Naturvidensk. **40**: 208. 1902.

Lecanora rubina (Vill.) Ach. var. *melanophthalma* (Ram.) Zahlbr. f. *exsulans* (Th. Fries) Zahlbr., Cat. Lich. Univ. 5: 660. 1928.

Type: S. Victoria Land, Geikie Land [71° 40′ S., 170° E.], 100 m., *C. E. Borchgrevink* (in Upsala and Oslo).

Thallus in pulvinate tufts up to 2.2 cm. in diameter and 5–6 mm. high, rather fragile, deeply scrobiculate, thick, margin crenulate in young specimens, soon concealed by the apothecia which are sessile at first, becoming stalked, light ochraceous buff to ochraceous buff (dry).

Apothecia up to 4 mm. in diameter, disc light ochraceous buff at first, becoming dusky green, slightly pruinose, margin remaining concave, thin and smooth at first, becoming thicker and crenate, exciple smooth at first, becoming rugose-sulcate.

Growing over *Sarconeurum glaciale.*

South Victoria Land: Geikie Land, 71° 40′ S. 170° E., 100 m., *C. E. Borchgrevink; Newnes Land*, 20 m., *C. E. Borchgrevink.*

Lecanora **Siplei** Dodge & Baker, sp. nov.

Pl. 47, figs. 146–151; pl. 63, figs. 413, 415.

Type: Marie Byrd Land, Edsel Ford Range, Skua Gull Peak, *P. Siple & S. Corey 72W-13.*

Thallus funiculatus aut in areolis ad 0.9 mm. diametro, coriaceus, aut sub apotheciis inconspicuus, griseo-fumatus vel ravus, fuscus madefactus, ad 650 μ crassitudine; cortex superior ad 40 μ crassitudine, fastigiatus, hyphis 1–2 μ diametro, pachydermaticis, strato gelifacto circa 4 μ crassitudine tectus; stratum gonidiale ad 100 μ crassitudine, protococcoideum, cellulis ad 10 μ diametro, raro in coloniis per totum thallum sparsis; medulla 300–500 μ crassitudine, hyphis 2–3 μ diametro, irregulariter reticulatimque implexis, densioribus circum algas; cortex inferior superiori similis cum cellulis isodiametricis obscuris exteris sparsis.

Apothecia ad 3 mm. diametro, singula aut in catervis ad 3 cm. diametro, plus minusve circularia, juventute marginibus inflexis, dein plana vel etiam repanda, marginibus crenulatis, obscure olivaceo-alutaceis, disco viridi-nigricante; amphithecium 120–150 μ crassitudine, cortex ut in thallo, sed strato gelifacto crassiori ad 50 μ, algae densissime per medullam compactae vel solo sub hypothecio; parathecium deest; hypothecium 8–10 μ crassitudine, hyphis tenuibus dense subpericlinalibus compactum, hyalinum; thecium 30–40 μ altitudine; paraphyses 1–1.5 μ, apicibus 1.5–2.5 μ diametro, gelifactis non obscuris, septati, simplices vel ramosi; epithecium 10–15 μ, hyalinum obscurascensque; asci 33–40 × 10–15 μ, clavati, vaginati; ascosporae octonae, 6.5–8 × 3.5–4.5 μ, late ellipsoideae, raro subreniformes, hyalinae.

Assimilative thallus up to several centimeters in diameter, in rugged strands or areolate, the areolae up to 0.9 mm., leathery, or inconspicuous and limited to the basal regions of the apothecia, hard and leathery when dry, smoke gray to drab,

becoming flexible and fuscous when moist, up to 650 μ thick; upper cortex up to 40 μ thick, fastigiate, marginal hyphae free, subdistant, branched near the surface, 1 μ in diameter, expanding to terminal cells 2 μ in diameter, cell contents much reduced, covered by a gelified layer about 44 μ thick; algal layer up to 100 μ thick, protococcoid, cells up to 10 μ, sometimes scattered throughout the medulla which is 300–500 μ thick, of slender hyphae 2–3 μ in diameter, irregularly interwoven in a close net, denser about the algae; lower cortex similar to the upper with the same darkening near the base, also showing scattered dark pseudoparenchymatous cells on the outside.

Apothecia up to 3 mm. in diameter, single or in clusters as large as 3 cm. in diameter, more or less circular, deeply inrolled when young, opening to flat and even repand at maturity, sage green to deep slate olive or dull greenish black when well developed, light, plane or crenulate, deep olive buff or chamois, disc from sage-green to black; amphithecium 120–150 μ thick, cortex continuous and identical with that of the thallus; algae densely packed throughout the medulla or restricted to a layer beneath the hypothecium, the gelified layer on the outer surface up to 50 μ thick; parathecium not differentiated; hypothecium 8–10 μ thick, hyaline, of closely interwoven hyphae mostly periclinal; thecium 30–40 μ tall; paraphyses 1–1.5 μ, broadening to tips 1.5–2.5 μ, usually not darkened although frequently with enlarged gelified heads, septate, branched or simple; epithecium 10–15 μ, varying from light to dark; asci 33–40 × 10–15 μ, clavate, with a moderately thick gelified sheath, 8-spored; ascospores 6.5–8 × 3.5–4.5 μ, broadly ellipsoidal, rarely somewhat reniform, hyaline.

On soil from dark greenish gray slate and orthoclase-sericite-siderite schist.

MARIE BYRD LAND: Edsel Ford Range, Skua Gull Peak, *P. Siple & S. Corey 72W-4, 72W-13*, type, *72W-14, 72W-15*.

LECANORA **griseomarginata** Dodge & Baker, sp. nov.

Pl. 47, figs. 152–156.

Type: Marie Byrd Land, Edsel Ford Range, Mt. Donald Woodward, *P. Siple, F. A. Wade, S. Corey & O. D. Stancliff DW-1.*

Thallus 1–1.5 mm. diametro, crustosus, rugosus, inconspicuus, griseo-albus, mollis gelifactusque madefactus; cortex 20–30 μ crassitudine, cellulis parvis isodiametricis, strato gelifacto tectus; algae protococcoideae, ad 10 μ diametro, sparsae aut in strato 50 μ crassitudine basaliter dispositae; medulla 200–450 μ crassitudine, hyphis tenuibus laxe reticulatimque dispositis; cortex inferior non bene evolutus, cellulis obscurioribus, plus minusve amorphus cum cellulis magnis, liberis, obscuris, isodiametricis.

Apothecia ad 1.2 mm. diametro, irregulariter circularia, marginibus prominentibus, inflexis juventute, expansis repandisve maturitate, nigra, griseo-marginata; amphithecium 80–150 μ crassitudine, cortice ei thalli simili, cum paucis cellulis liberis obscuris isodiametricis; medulla cum eo thalli continua, algis lateraliter abundantibus, paucis sub hypothecio; parathecium 15–20 μ crassitudine, hyalinum; hypothecium centro 70 μ crassitudine, lateraliter ad 10 μ tenuescens, insuper in parathecium expansum; thecium 55–60 μ altitudine; paraphyses 0.5–1 μ, recti, simplices, cellulis apicalibus frequenter obscuris vagina 7 × 10 μ tectis, epithecium 10–12 μ, obscurum; asci 46–54 × 11–18.5 μ, late clavati maturitate; ascosporae octonae, 8.5–12.5 × 5–6 μ, ellipsoideae, hyalinae.

Thallus 1–1.5 mm. in diameter, crustose, rugose but quite inconspicuous, grayish white, mostly limited to the apothecial regions, when moist soft and somewhat gelified; cortex 20–30 μ thick, pseudoparenchymatous, of very small cells, covered by a thin gelified sheath which is often lacking in places and replaced by large dark isodiametric cells, which often penetrate the medulla a long way; algae up to 10 μ in diameter, protococcoid, scattered or in a zone about 50 μ thick in the basal region; medulla 200–450 μ thick, of loosely woven slender hyphae; lower cortex not differentiated beyond the darkening of cells which also become more or less amorphous, and the presence of free, large, dark, isodiametric cells.

Apothecia up to 1.2 mm. in diameter, irregularly circular, margin inrolled when young, expanded to almost repand at maturity, black with a gray margin; amphithecium 80–150 μ thick, cortex continuous with that of the thallus, with a few free dark isodiametric cells; medulla also continuous with that of the thallus, algae abundant laterally but few below the hypothecium; parathecium 15–20 μ, hyaline; hypothecium 70 μ thick in the center, thinning laterally to 10 μ and expanding above into the parathecium; thecium 55–60 μ tall; paraphyses 0.5–1.0 μ in diameter, straight, septate, simple, not expanding above but apical cell covered by a large gelified sheath 7 μ in diameter and 10 μ long, usually darkened, epithecium 10–12 μ,

dark; asci 46–54 × 11–18.5 μ, broadly clavate at maturity, 8-spored; ascospores 8.5–12.5 × 5–6 μ, ellipsoidal, hyaline.

On loose sandy loam, on clumps of mosses and dark greenish gray slate.

MARIE BYRD LAND: Edsel Ford Range, Mt. Donald Woodward, *P. Siple, F. A. Wade, S. Corey & O. D. Stancliff DW-1*, type, *DW-3*; Skua Gull Peak, *P. Siple & S. Corey 72W-2, 72W-3, 72W-9, 72W-14*; Lichen Peak, *P. Siple & S. Corey 73-3, 73-4, 73-7*.

LECANORA **lilacina** Dodge & Baker, sp. nov.

Pl. 47, figs. 157–160.

Type: Marie Byrd Land, Edsel Ford Range, Lichen Peak, *P. Siple & S. Corey 73-7*.

Thallus rarus, inconspicuus, granulosus, dilute lilacinus; ecorticatus; algae ad 12 μ diametro, protococcoideae, per totum thallum sparsae; medulla ad 200 μ crassitudine, hyphis 3–4 μ diametro, laxe implexis; cortex inferior deest.

Apothecia ad 1.2 mm. diametro, irregularia, repanda, marginibus crenulatis, olivaceis, umbrina obscuriorave, juventute lilacina, plana, emarginata; amphithecium 60–75 μ, cortex 30–40 μ, pseudoparenchymaticus, cellulis exteris obscurioribus; parathecium circa 5 μ crassitudine, hyalinum, hyphis periclinalibus; hypothecium centro circa 20 μ, lateraliter tenuescens, hyalinum; thecium 50–80 μ altitudine; paraphyses 1 μ diametro, sub apicibus ramosi, capitibus ad 3 μ diametro, septati, vaginati, gelifacti, epithecium 5–8 μ, hyalinum; asci 38–44 × 11–14 μ, breve clavati, vaginati; ascosporae octonae, 8–10 × 4–6 μ, late ellipsoideae, hyalinae, juventute vaginatae.

Assimilative thallus very scant, inconspicuous, granulose, pale drab gray; ecorticate; algae up to 12 μ in diameter, protococcoid, scattered throughout the thallus; medulla up to 200 μ thick, of rather coarse hyphae 3–4 μ in diameter, loosely woven; lower cortex absent. Myxophyceae, mostly *Stigonema,* cling to the outer surfaces, sometimes in well-defined patches but do not form true cephalodia.

Apothecia up to 1.2 mm. in diameter, irregularly circular, pale drab gray, flat and emarginate when young, becoming convex, Saccardo's umber to chaetura black with crenulate margins olive buff and light olive gray; amphithecium 60–75 μ, cortex 30–40 μ thick, pseudoparenchymatous, the outer cells somewhat darkened occasionally with patches of foreign algae; medulla identical and continuous with that of the thallus; parathecium about 5 μ thick, hyaline, of periclinal hyphae;

hypothecium hyaline, about 20 μ thick at the center, thinning rapidly toward the outer edge; thecium 50–80 μ high; paraphyses 1 μ, heads 3 μ expanding abruptly, branched just below the tips, septate with a thick sheath, outer surfaces a little darkened, gelified, epithecium 5–8 μ, hyaline; asci 38–44 × 11–14 μ, short- but slender-clavate with a thick sheath, 8-spored; ascospores 8–10 × 4–6 μ, hyaline, broadly ellipsoidal, with a sheath when young.

On sandy loam, light pink leucogranite, and gray slate.

MARIE BYRD LAND: Edsel Ford Range, Mt. Rea-Cooper, *P. Siple, F. A. Wade, S. Corey & O. D. Stancliff R-1*; Lichen Peak, *P. Siple & S. Corey 73-4, 73-7*, type.

LECANORA **lilacinofusca** Dodge & Baker, sp. nov.

Pl. 48, figs. 161–166.

Type: Marie Byrd Land, Edsel Ford Range, Lichen Peak, *P. Siple & S. Corey 73-4.*

Thallus ad 0.95 mm. diametro, inconspicuus, lilacino-fuscus, mollissimus gelifactusque madefactus; ecorticatus; algae ad 15 μ diametro, protococcoideae, coloniis parvis per totum thallum sparsae; medulla ad 500 μ crassitudine, hyphis tenuibus, 1 μ diametro, laxissime implexis, compactioribus ad margines apotheciaque; stratum basale deest.

Apothecia ad 0.65 mm. diametro, irregularia, marginata, concava et alba juventute dein griseo-brunnea, sessilia; amphithecium 50–60 μ crassitudine, cortex circa 10 μ crassitudine, male evolutus, pseudoparenchymaticus, medulla compacta, reticulata, algae sparsae aut in coloniis; parathecium paucis cellulis male evolutum; thecium 50–70 μ altitudine; paraphyses circa 1 μ diametro, capitibus 5 μ diametro, obscure viridibus brunneisve, simplices aut sub apicibus ramosi, septati, vaginati, epithecium viridi-brunneum, 8–10 μ crassitudine; asci 48–55 × 13–16 μ, elongato-clavati, vaginati; ascosporae octonae, 11.5–13 × 4.5–5.5 μ, ellipsoideae, apicibus subacutis obtusisve, hyalinae.

Assimilative portions up to 0.95 mm. in diameter, inconspicuous, brownish-drab, very soft and gelified when moist; cortex absent; algae up to 15 μ in diameter, protococcoid, rare, scattered throughout the thallus in small colonies; medulla up to 500 μ thick, of slender hyphae about 1 μ in diameter, very loosely woven, slightly more compact near the margins and apothecia; basal layer not developed.

Apothecia up to 0.65 mm. in diameter, irregularly circular, concave when young with a slight margin at maturity, white becoming dark gray-brown, sessile, scant; amphithecium 50–

60 μ thick, cortex about 10 μ thick, poorly developed, pseudoparenchymatous, becoming indistinct below at the confluence with the thallus, algae rather abundant, scattered throughout, singly or in groups; parathecium scarcely distinguishable, limited to a few cells at the apothecial margin; hypothecium about 20 μ thick, compact, of slender interwoven hyphae; thecium 50–70 μ tall; paraphyses about 1 μ in diameter expanding to heads about 5 μ in diameter, dark green to brown, septate with a close sheath, epithecium 8–10 μ thick, greenish-brown; asci 48–55 × 13–16 μ, elongate-clavate with a moderate sheath, 8-spored; ascospores 11.5–13 × 4.5–5.5 μ, ellipsoidal, the ends sometimes a little pointed, mostly blunt, hyaline.

Among mosses on loose sandy loam.

MARIE BYRD LAND: Edsel Ford Range, Lichen Peak, *P. Siple & S. Corey 73-4*, type.

LECANORA **carbonacea** Dodge & Baker, sp. nov.

Pl. 46, figs. 142–145.

Type: Marie Byrd Land, Edsel Ford Range, Skua Gull Mt., *P. Siple & S. Corey 72W-6.*

Thallus ad 1 mm. diametro, crustosus, plus minusve continuus, subgranulosus, sparsus, inconspicuus madefactus, alutaceus; cortex 20–30 μ, fastigiatus, reticulatusve aut paucis cum cellulis obscuris isodiametricis; algae protococcoideae, ad 10 μ diametro, sparsae vel in strato 30–60 μ crassitudine sub cortice dispositae; medulla 50–60 μ crassitudine, hyphis laxe reticulatimque dispositis; cortex inferior non bene evolutus, paucis cellulis obscuris isodiametricis sparsis.

Apothecia ad 0.75 mm. diametro, applanata, margine subcrenulata, nigra, carbonacea; amphithecium 50–70 μ crassitudine; cortex bene evolutus, ei thalli similis; parathecium 20–35 μ crassitudine, cellulis fastigiatis, exteris obscuris; hypothecium centro 20–30 μ crassitudine, lateraliter tenuescens ad 10 μ crassitudine, hyalinum; thecium 40–50 μ altitudine; paraphyses 0.75–1.0 μ diametro, septati, non ramosi, capitibus ad 5 μ diametro, obscuris, epithecium 5–12 μ, subvirescens, KOH–; asci 37–43.5 × 12–15 μ, breviter clavati, basi obtusi latique, vaginati; ascosporae octonae, (8–) 9–11 × 4–4.5 μ, ellipsoideae vel subreniformes aut ovoideae, hyalinae.

Thallus up to 1 mm. in diameter, crustose, more or less continuous, somewhat granulose when soaked and loosened from the rock, scattered, inconspicuous, dull tan; cortex 20–30 μ thick, fastigiate, closely interwoven, or sometimes lacking except for a few scattered dark isodiametric cells; algae up to 10 μ in diameter, protococcoid, scattered in the thallus or in a

layer 30–60 μ thick below the cortex; medulla 50–60 μ thick, of loosely reticulate hyphae, occasionally more or less amorphous near the base; lower cortex not differentiated beyond dark isodiametric cells, scattered and not continuous.

Apothecia up to 0.75 mm. in diameter, flattened, more or less circular in outline with a suggestion of a crenulate margin and a faint rim, black, very carbonaceous; amphithecium 50–70 μ thick; cortex well developed, with abundant algae, of the same structure as the thallus; parathecium 20–35 μ thick, of fastigiate cells, the outer ones darkened; hypothecium 20–30 μ thick in the center, thinning laterally to 10 μ or less, then expanding upward into the parathecium, hyaline, similar to the cortex but more compact; thecium 40–50 μ tall; paraphyses 0.75–1.0 μ in diameter, slender, septate, usually unbranched (if so, at a considerable distance from the apex), expanding to large heads 5 μ in diameter, with a thick dark cap, epithecium 5–12 μ thick, dark greenish, KOH–; asci 37–43.5 × 12–15 μ, short-clavate, blunt and rather broad at the base with a moderately prominent sheath, 8-spored; ascospores (8–) 9–11 × 4–4.5 μ, ellipsoidal to slightly reniform or ovoid, hyaline.

On fine-grained dike rock.

MARIE BYRD LAND: Edsel Ford Range, Skua Gull Peak, *P. Siple & S. Corey 72W-6.*

LECANORA **fuscobrunnea** Dodge & Baker, sp. nov.

Pl. 48, figs. 172–175.

Type: South Victoria Land, Queen Maud Mts., Durham Point, northeast portal of Thorne Glacier, *Q. A. Blackburn, R. S. Russell, Jr. & S. D. L. Paine QM-4.*

Thallus ad 0.75 mm. diametro, rarus, granulosus, fusco-brunneus albusve, mollis madefactus; cortex pseudoparenchymaticus stratis singulo aut duobus cellularum, insuper cum strato gelifacto ad 50 μ crassitudine; algae ad 15 μ diametro, protococcoideae, rarae, in parte superiore sparsae; medulla ad 300 μ crassitudine, hyphis tenuibus, 1–3 μ, reticulatim et raro laxe dispositis; cortex inferior superiori similis sine strato gelifacto.

Apothecia ad 0.4 mm. diametro, marginata emarginatave, nigra, carbonacea, sessilia; amphithecium 50–70 μ crassitudine, cortex ei thalli similis; algae abundantes, stratum 50 μ crassitudine sub hypothecio formantes; parathecium non evolutum, paucis cellulis inter amphithecium theciumque exceptis; hypothecium circa 10 μ crassitudine, hyalinum, hyphis compacte reticulatimque dispositis; thecium circa

50–60 μ altitudine; paraphyses 1–1.5 μ, sub apice ramosi, capitibus circa 3.5 μ diametro, septati, epithecium obscurum, 10 μ crassitudine, insuper cum strato gelifacto 5–15 μ, KOH–; asci 46–48 × 12.5–14 μ, obtuse clavati; ascosporae octonae, 13–15 × 4–6 μ, ellipsoideae, appendiculatae juventute, vaginatae, hyalinae.

Assimilative thallus up to 0.75 mm. in diameter, scant, granulose, drab brown to white, soft when moistened; cortex of brown to fuscous pseudoparenchyma in one or two layers of cells, denser near the base with a gelified layer on the outer surfaces up to 50 μ thick; algae up to 15 μ in diameter, protococcoid, scattered, in the upper part of the thallus not numerous; medulla up to 300 μ thick, of slender, closely reticulate hyphae 1–3 μ in diameter, occasionally with quite open meshes; lower cortex identical with the upper without the gelified layer on the surface.

Apothecia up to 0.4 mm. in diameter, irregularly circular, emarginate or with a faint rim, black, carbonaceous, sessile; amphithecium 50–70 μ thick, cortex as in the thallus; algae abundant, especially beneath the hypothecium where they often form a layer 50 μ thick; medulla identical and continuous with that of the thallus; parathecium not differentiated save for a few cells between epithecium and amphithecium; hypothecium about 10 μ thick, hyaline, of closely reticulate hyphae; thecium about 50–60 μ tall; paraphyses 1–1.5 μ in diameter, branched near the tips, septate, expanding to heads about 3.5 μ in diameter, slightly darkened on the outside, epithecium dark, about 10 μ thick with a gelified layer 5–15 μ thick, not changing color with KOH; asci 46–48 × 12.5–14 μ, bluntly clavate, 8-spored; ascospores 13–15 × 4–6 μ, ellipsoidal, hyaline, with a thin sheath, when young with appendages at the lower ends which later break off.

On granitic sandy loam.

SOUTH VICTORIA LAND: Queen Maud Mts., Durham Point, northeast portal of Thorne Glacier, *Q. A. Blackburn, R. S. Russell Jr. & S. D. L. Paine QM-4.*

LECANORA **subolivacea** Dodge & Baker, sp. nov.

Pl. 48, figs. 167–171.

Type: Marie Byrd Land, Edsel Ford Range, Mt. Rea-Cooper, *P. Siple, F. A. Wade, S. Corey & O. D. Stancliff R-7.*

Thallus ad 0.65 mm. diametro, rarus, subolivaceus, pulvinatus, irregulariter circularis, sparsus aut gregarius, mollis madefactus; cortex ad 30 μ crassitudine, fastigiatus aut ad apothecium pseudoparenchymaticus, cellulis ad 3 μ diametro; algae ad 10 μ diametro, protococcoideae, rarae, coloniis parvis sparsis; medulla ad 300 μ crassitudine, hyphis tenuibus, circa 2 μ diametro, insuper compactis, centro laxissime implexis, basaliter subpericlinalibus; cortex inferior deest.

Apothecia ad 0.75 mm. diametro, pulvinata, emarginata, olivacea nigrave, non nitida, sparsa, singula; amphithecium 80–90 μ crassitudine, cortex 10–30 μ, pseudoparenchymaticus, algae abundantes; parathecium 10–20 μ crassitudine, male evolutum; hypothecium 10–20 μ, hyalinum, non tenuescens; thecium 70–80 μ altitudine; paraphyses 1–1.5 μ diametro, septati, gelifacti, capitibus 3 μ, simplices aut sub capitibus ramosi; epithecium 5–10 μ, obscurum, gelifactum, KOH addito virescens; asci 58–61 × 14–15 μ, tenuiter clavati; ascosporae octonae, 14–15 × 5–6.5 μ, ellipsoideae vel subovoideae, hyalinae.

Assimilative thallus up to 0.65 mm. in diameter, scant, pale olive buff to olive buff, limited to separate pulvinate areolae, irregularly circular, later almost entirely covered by apothecia, scattered or closely clustered, soft when moist; cortex up to 30 μ thick, fastigiate in places, usually pseudoparenchymatous near the apothecium, the cells about 3 μ in diameter; algae up to 10 μ in diameter, protococcoid, rare, in small colonies scattered throughout the thallus; medulla about 300 μ thick, of slender hyphae about 2 μ in diameter, closely reticulate above, very loose in the center and in more or less periclinal strands below; lower cortex not differentiated.

Apothecia up to 0.75 mm. in diameter, pulvinate, without a prominent margin, olive buff to citrine drab or black, not shining, scattered and usually single; amphithecium 80–90 μ thick, cortex 10–30 μ, pseudoparenchymatous, algae abundant throughout; medulla identical and continuous with that of the thallus; parathecium 10–20 μ thick, scarcely distinguished except the few outer cells whose exposed surfaces are darkened as those of the epithecium; hypothecium hyaline, 10–20 μ thick, fibrous, not tapering; thecium 70–80 μ tall; paraphyses 1–1.5 μ, conspicuously septate, expanding to heads up to 3 μ, gelified but not darkened, simple or branched near the tips; epithecium 5-10 μ thick, dark, gelified, turning green with KOH; asci 58-61 × 14–15 μ long, slender-clavate, more broadly so at maturity, 8-spored; ascospores 14–15 × 5–6.5 μ, ellipsoidal to slightly ovoid, hyaline.

On coarse-grained granite.

MARIE BYRD LAND: Edsel Ford Range, Mt. Rea-Cooper, *P. Siple, F. A. Wade, S. Corey & O. D. Stancliff R-7.*

CANDELARIELLA

CANDELARIELLA Müll. Arg., Bull. Herb. Boiss. 2: app. 1: 11. 1894.

The type species is *Candelariella vitellina* (Ach.) Müll. Arg.

Thallus crustose, uniform, horny, verrucose or effigurate (sect. *Caloplacopsis)*, bright yellow, not colored red by KOH, attached to the substrate by hyphae of the prothallus or of the medulla, without rhizinae, heteromerous; with *Protococcus*. Apothecia sessile, circular, yellow, not colored red by KOH, lecanorine; hypothecium hyaline with algae below; paraphyses unbranched, non-septate or septate near the tip; asci 8- to many-spored; ascospores hyaline, elongate to ellipsoidal, 1–2-celled with thin septum and walls. Spermogonia very small, punctiform, yellow, spermatiophores scantily septate, forked or branched, short-celled; spermatia short, straight.

No previous reports from Antarctica.

Candelariella chrysea Dodge & Baker, sp. nov.

Pl. 49, figs. 181–191.

Type: Marie Byrd Land, Edsel Ford Range, Chester Mts., *P. Siple & S. Corey 97A-1.*

Thallus conspicuus, pars non-assimilans 250 μ crassitudine, funiculis nigris sub parte assimilativa, cortex 10–30 μ, pseudoparenchymaticus; medulla 150–200 μ crassitudine, cellulis hyalinis; stratum basale ad 50 μ crassitudine, cellulis pachydermaticis brunneis; pars assimilans ad 500 μ crassitudine, cadmii flava, KOH addito immutata, verrucosa; cortex 20–50 μ crassitudine, pseudoparenchymaticus, paucis cellulis fastigiatis exteris, raro cum strato cellularum emortuarum tectus; algae per totam areolam sparsae, cellulis 3–3.5 μ diametro, protococcoideis; medulla circa 350 μ crassitudine, cellulis regularibus compactisque; stratum basale ad 25 μ crassitudine, cortici simile; isidia plus minusve spherica, 100 μ diametro, cortex ad 10 μ crassitudine, pseudoparenchymaticus, algae abundantes, medulla hyphis laxe reticulatimque implexis.

Apothecia 0.5–2 mm. diametro, irregularia vel circularia, marginibus subcrenulatis, non inflexis, sparsa vel gregaria, sessilia in areolis assimilantibus, ochraceo-aurantia; parathecium ad 75 μ crassitudine, ex hypothecio oriens, cellulis tenuibus insuper ramosis, corticem efficiens; hypothecium circa 50–60 μ crassitudine, cellulis isodiametricis verticaliter dispositis, in medullam mergens, hyalinum; thecium ad 175 μ altitudine; paraphyses 1 μ, apicibus 1.5–2.5 μ diametro, clavatis,

ramosi vel non ramosi, evaginati, septati; asci 57–84 × 17–25 μ, polyspori, late clavati, vaginati; ascosporae 10–15 × 4.5–7 μ, ellipsoideae vel subreniformes, raro guttulatae, hyalinae, unicellulares.

Thallus conspicuous over areas of several centimeters, occasionally on rocks but usually with mosses and amongst gravel and soil; non-assimilative portion up to 250 μ thick, macroscopically of blackened strands below the assimilative portions; upper cortex from 10 to 30 μ thick, of regular isodiametric cells with only moderately thickened walls; medulla 150–200 μ thick, of hyaline cells with progressively thinner walls from the cortex to the center; basal cortex up to 50 μ thick, very well developed, of thick-walled cells in a compact layer, brown; assimilative portion up to 500 μ thick, verrucose, cadmium yellow, no color change with KOH; cortex 20–50 μ thick, of regular pseudoparenchyma with a few dark fastigiate cells scattered on the outer surface, occasionally a layer of dead cortical cells outside the fastigiate cells; algae protococcoid, scattered throughout the areole, cells 3–3.5 μ in diameter; medulla about 350 μ thick, of regular and compact cells; basal layer up to 25 μ, not morphologically differentiated from the cortex; isidia more or less spherical, about 100 μ in diameter with a pseudoparenchymatous cortex up to 10 μ thick, internally of loose reticulate hyphae and abundant algae.

Apothecia 0.5–2 mm. in diameter, irregular to circular with the margin slightly crenulate, not inrolled, scattered or in groups, sessile on the assimilative areolae, ochraceous orange; parathecium up to 75 μ thick, spreading from the hypothecium, of slender cells branching at the surface to form the cortex; hypothecium 50–60 μ thick, of cells closely arranged in a palisade, disappearing basally as it merges with the cells of the compact medullar tissue, hyaline; thecium up to 175 μ tall; paraphyses 1 μ in diameter expanding to slightly enlarged apices about 1.5–2.5 μ, clavate, branched or unbranched, without a sheath, septate; asci 57–84 × 17–25 μ, polysporous, broadly clavate with a well-developed gelified sheath; ascospores 10–15 × 4.5–7 μ, ellipsoidal to somewhat reniform, occasionally with faint oil droplets, hyaline.

The exposed surfaces of the assimilative, non-assimilative

and apothecial parts are frequently blackened by the abundance of a dematiaceous hyphomycete. The parasitic cells vary in size (see pl. 49, figs. 181, 182), sometimes surrounding completely a few algae in a more or less spherical mass (see pl. 49, fig. 183a) which possibly function as soredia.

On sandy loam and coarse-grained gray granodiorite.

MARIE BYRD LAND: Edsel Ford Range, Chester Mts., *P. Siple & S. Corey 97A-1*, type, *97A-2*; Lichen Peak, *P. Siple & S. Corey 73-3*.

CANDELARIELLA **albovirens** Dodge & Baker, sp. nov.

Pl. 48, figs. 176–178; pl. 49, figs. 179–180b.

Type: Marie Byrd Land, Edsel Ford Range, Mt. Corey, *P. Siple & S. Corey 112E-2*.

Thallus non assimilans funiculis radiantibus 1–2 mm. longitudine, nigris; areae assimilantes ad 2 mm. diametro, crustosae vel areolatae, arachnoideae, albae, flavovirentes; cortex ad 25 μ crassitudine, non continuus, cellulis fastigiatis confertis, exteris obscuris; stratum gonidiale 20–30 μ crassitudine, cellulis ad 8 μ diametro, raro sparsis; medulla 300–450 μ crassitudine, hyphis circa 3 μ diametro, ramosis, laxe reticulatimque dispositis; cortex inferior non evolutus, paucis cellulis isodiametricis obscuris sparsis.

Apothecia ad 1.5 mm. diametro, concava vel plana maturitate, cylindrica basi attenuata, subsessilia vel sessilia, flava viridiave maturitate, gregaria vel singula; amphithecium 150–180 μ crassitudine, cortex ad 30 μ crassitudine, fastigiatus, continuus cum eo thalli; algae sparsae, abundantes; parathecium non evolutum; hypothecium 40–50 μ crassitudine, hyphis periclinalibus, verticaliter in centro dispositis, densum, hyalinum; thecium 40–60 μ altitudine; paraphyses 1–2 μ diametro, apicibus 3 μ, obscuris, non ramosi, recti, raro e cellulis penultimis ultimisve ramosi, septati, leptodermatici, guttulati, KOH addito subvirescentes; epithecium circa 5 μ crassitudine, tenue, hyalinum; asci 30–35 × 9.5–13 μ, breviter clavati; ascosporae octonae, 7–11 × 3–4 μ, ellipsoideae vel reniformes, hyalinae.

Non-assimilative portions of the thallus represented by black rhizoidal strands radiating for 1–2 mm. from the assimilative and apothecial regions; assimilative parts up to 2 mm., limited almost entirely to the basal portions of apothecia, scant, crustose, areolate to arachnoid, white to yellowish green; cortex up to 25 μ, not continuous over the whole surface, of fastigiate closely packed cells, the outer ones sometimes darkened with occasional scattered patches of dark isodiametric cells; algal layer 20–30 μ thick, protococcoid, cells up to 8 μ in diameter, parallel to the apothecium, rarely scattered in the thallus; medulla 300–450 μ thick, of loosely woven branched

hyphae 3 μ in diameter; lower cortex not developed, covered basally by a few dark isodiametric scattered cells.

Apothecia up to 1.5 mm. in diameter, more or less circular, concave to plane at maturity, cylindrical with attenuated bases, subsessile to sessile, white when young, yellow to green at maturity, gregarious or single; amphithecium 150–180 μ thick, cortex up to 30 μ thick, fastigiate, continuous with that of the thallus, medulla continuous with the thalline medulla, algae scattered, abundant; parathecium not differentiated; hypothecium 40–50 μ thick, of hyphae periclinal toward the sides of the apothecium, but erect and vertical toward the center, dense, hyaline; thecium 40–60 μ tall; paraphyses 1–2 μ in diameter, expanding above, the apical cells up to 3 μ in diameter, darkened on the outer layers, occasionally with a dark encrusting mass adhering to them, mostly simple, straight, septate, sometimes branching from the ultimate or penultimate cells, thin-walled, with conspicuous oil droplets, slightly green with KOH, epithecium about 5 μ, hyaline; asci 30–35 × 9.5–13 μ, short-clavate, 8-spored; ascospores 7–11 × 3–4 μ, slender, ellipsoidal to reniform, hyaline.

On coarse-grained granite and highly weathered coarse-grained leucogranite, quartzite, dark greenish gray slate, and sericite-orthoclase schist.

MARIE BYRD LAND: Edsel Ford Range, Mt. Corey, *P. Siple & S. Corey 112E-2*, type; Chester Mts., *P. Siple & S. Corey 97A-3*; Lichen Peak, *P. Siple & S. Corey 73-1, 73-10*; Skua Gull Peak, *P. Siple & S. Corey 72W-7*.

KING EDWARD VII LAND: Rockefeller Mts., Mt. Helen Washington, *P. Siple & S. Corey HW-11, HW-13*.

LECANIA

LECANIA Massalongo, Alcun. Gen. Lich. 12. 1855.

The type species is *Lecania fuscella* Mass.

Thallus crustose, uniform, effigurate, squamose or dwarf-fruticose, attached to the substrate by the hyphae of the prothallus or of the medulla, without rhizinae, heteromerous; ecorticate or corticate; algae *Protococcus;* medulla loosely woven, of thin-walled hyphae. Apothecia sessile, round, lecanorine; parathecium lacking, incompletely or well developed; hypothecium hyaline with algae below; paraphyses un-

branched; asci normally 8, exceptionally 16–32-spored; ascospores hyaline, elongate to ellipsoid, straight or curved, 2- or more celled, thin-walled with cylindric cells.

The genus is usually divided into three sections (for characters see key to family, p. 568). *Thamnolecania* and *Eulecania* seem to be confined to the Antarctic Archipelago, although *Catillaria inconspicua* from Marie Byrd Land may belong in *Eulecania* as algae are found below the hypothecium but only at the margins.

KEY TO ANTARCTIC SPECIES

Thallus crustose, uniform, white or grayish............................EULECANIA
  Hypothallus white..*L. Racovitzae*
  Hypothallus black...........................*Catillaria inconspicua* (p. 548)
Thallus fruticulose, ascospores 4-celled..........................THAMNOLECANIA
  Ascospores 13–24 × 3–4.5 μ; thallus 6–13 mm. high..............*L. Brialmonti*
  Ascospores 10–14 × 4.5–5 μ; thallus 3–5 mm. high.................*L. Gerlachei*
  Ascospores 11–15 × 4 μ; thallus 10–12 mm. high, yellowish fuscescent....
    ....*L. cariosa*

PARMELIACEAE

Thallus foliose, resupinate to erect and almost fruticose, often attached to the substrate by rhizinae, dorsiventral; usually corticate on both surfaces, rarely ecorticate below *(Anzia)*; algae protococcoid, lower surface nearly nude or more usually covered with rhizinae which rarely anastomose to form a spongy hypothallus *(Anzia* and *Pannoparmelia)*; cyphellae present in *Pseudoparmelia* only. Apothecia circular, sessile to short-stipitate, amphithecium well developed; paraphyses branched or unbranched, often imbedded in a gel; asci 6–8-spored (16–32-spored in *Anzia* and *Candelaria)*; ascospores hyaline, unicellular.

Of the eleven commonly recognized genera of this family, only *Parmelia* and *Pannoparmelia* have been found in the Antarctic.

KEY TO ANTARCTIC SPECIES OF PANNOPARMELIA, PARMELIA, AND PHYSCIA

Rhizinae anastomosing to form a dense spongy hypothallus; laciniae narrow, appressed; ascospores small, subspherical...................PANNOPARMELIA
  Laciniae 0.7–1.0 mm. broad, subdichotomous, tips truncate, white...*P. pellucida*

Laciniae 0.3–0.6 mm. broad, irregularly branched, tips rounded, becoming gray and darkening.. *P. delicata*

Rhizinae not conspicuously anastomosing nor forming a hypothallus; laciniae larger; ascospores ellipsoidal, ovoid or spherical.................. *Parmelia*

Cortex of branched hyphae perpendicular to the surface of the thallus, cells more or less isodiametric, often giving the appearance of pseudoparenchyma in both upper and lower cortex....................... EUPARMELIA

Laciniae yellow, KOH yellow, verruculose granulose...... *Parmelia Gerlachei*

Laciniae pale fuscous, KOH–, smooth....................... *Physcia fuscella*

Upper cortex appearing pseudoparenchymatous above and often extending to the under-side of the tips of the lobes for a short distance; lower cortex of conglutinate slender periclinal hyphae, or decomposed........ .... PHYSCIOIDEAE

Thallus sorediose.

Thallus KOH– above.

Thallus pale straw to yellowish, 0.5–1.5 cm.; laciniae 1–2.5 mm. broad; soredia 1 mm., spherical, often eventually covering much of the upper surface; saxicolous............... *Physcia xanthotropa*

Thallus white, blackening, up to 3 cm.; laciniae 5–6 × .5–1 mm., soredia marginal; muscicolous.......................... *Physcia Leoniae*

Thallus KOH yellowing above.

Soredia confined to the under-side of the tips of the laciniae; medulla KOH–.. *Physcia tribacia*

Soredia scattered on the upper surface of the laciniae.

Margin with long white branched fibrils (cilia)..*Parmelia leucoblephara*

Margin eciliate.

Laciniae 0.6–0.8 mm., dichotomous, tips truncate, yellowish rarely graying; soredia eroded, common................. *P. variolosa*

Laciniae 0.4–0.5 mm., flabellate, tips rounded, gray and blackening, soredia eroded, rare......................... *P. Coreyi*

Laciniae 0.5–1.10 mm., polychotomous, tips dilated, white to bluish gray, soredia spherical....................... *Physcia caesia*

Thallus minutely isidiose, chestnut to black in the center, paler at margin; laciniae 0.5–0.8 mm. broad; medulla KOH slightly reddish.......... .... *Parmelia acervata*

Thallus neither sorediose nor isidiose.

Thallus black-margined, straw to white; laciniae 1–2 mm. broad, 5–7 mm. long, tips rounded; KOH–................ *Physcia puncticulata*

Thallus black variegated, yellow tabacine, KOH slightly yellowing; laciniae 0.4–0.6 mm. broad, tips crenulate........... *Physcia tabacina*

Thallus neither black variegated nor black-margined.

Thallus ashy rufescent, pruinose above, KOH–.... *Physcia pulverulenta*

Thallus whitish or grayish.

KOH rufescent; thallus pale olive buff then gray; laciniae 0.2–0.3 mm.. *Parmelia griseola*

KOH yellow.

Ascospores 10.5–14.5 × 3.5–4.5 μ; thallus gray and darkening; laciniae 0.8–1.0 mm......................... *Parmelia Coreyi*

Ascospores 16–26 × 8–11 μ; thallus white or glaucous; laciniae 1–2(–3) mm.................... *Physcia stellaris* v. *adpressa*

KOH– above.

Laciniae 1–2 mm. broad, tips dilated, ashy, scattered; rhizinae fuscous.................................. *Physcia disseminata*

Laciniae 0.5–0.7 mm. broad, tips dilated; rhizinae white, nigrescent.................................. *Physcia inordinata*

Laciniae 0.2–0.4 mm. broad, tips not dilated; rhizinae white .... *Physcia nitescens*

PANNOPARMELIA

PANNOPARMELIA Darbishire, Wiss. Ergebn. Schwed. Südpolar-Exp. 1901–1903. 4[11]: 11. 1912.

Anzia sect. *Pannoparmelia* Müll. Arg., Flora **72**: 507. 1889.

The type species is *P. angustata.* (Pers.) Darb.

Thallus foliose, laciniate, lobes elongate, narrow, appressed; upper cortex fastigiate; algae protococcoid; medulla loosely woven; lower cortex well developed, producing an anastomosing network of rhizinae which form a hypothallus, giving the appearance of *Pannaria.* Apothecia sessile on the upper surface, amphithecium well developed, epithecium amorphous; hypothecium hyaline with algae below; paraphyses imbedded in a gel; asci 8-spored; ascospores small, subspherical, thin-walled. Spermogonia unknown.

At first sight this genus appears to be a small *Pannaria* with a very highly developed brownish black hypothallus, but has protococcoid algae, and a parmelioid apothecium. *P. angustata* (Pers.) Darb. was described from New Zealand, and *P. anzioides* Darb. (*P. Darbishireana* Zahlbr.) from Tierra del Fuego. The well-developed lower cortex, with the anastomosing rhizinae forming a prominent hypothallus, makes it possible to recognize the genus even in the sterile condition.

PANNOPARMELIA **pellucida** Dodge & Baker, sp. nov.

Pl. 63, fig. 417; pl. 64, figs. 418, 421, 422.

Type: Marie Byrd Land, Edsel Ford Range, Lichen Peak, *P. Siple & S. Corey 73-1.*

Thallus ad 1.5 cm. diametro, laciniatus, laciniae 0.7–1.0 mm. latitudine, subdichotome ramosae, subtruncatae, albidus, subpellucidus, minute pruinosus; cortex superior 15 μ crassitudine, pseudoparenchymaticus, 2–3 stratis cellularum pachydermaticarum; algae non visae; medulla 90–100 μ crassitudine, arachnoidea, hyphis

verticalibus 2–3 μ diametro, leptodermaticis, reticulatim dispositis; cortex inferior 20–30 μ crassitudine, hyphis periclinalibus conglutinatis; rhizinae 40–50 μ diametro, hyphis tenuibus longitudinalibus conglutinatis.

Thallus up to 1.5 cm. in diameter, laciniate, laciniae 0.7–1.0 mm. broad, subdichotomously branched, rather truncate, white, subpellucid, minutely pruinose; upper cortex 15 μ thick, pseudoparenchymatous, of 2–3 layers of thick-walled large cells; algae not seen; medulla 90–100 μ thick, arachnoid, of thin-walled vertical hyphae 2–3 μ in diameter, loosely tangled to reticulate; lower cortex 20–30 μ thick, of periclinal hyphae imbedded in a deeply staining gel; rhizinae 40–50 μ in diameter, of gelified slender longitudinal hyphae, anastomosing into a spongy network and forming a hypothallus which extends some distance beyond the laciniae, giving the appearance of a species of *Pannaria*.

It is with some hesitation that we have described this as a new species. The rhizinae and lower portion of the medulla are invaded by a dematiaceous fungus which reaches the upper cortex in one place. It would seem to be an old thallus from which the algae have completely disappeared, and to show no trace of apothecia.

On sericite-orthoclase schist.

MARIE BYRD LAND: Edsel Ford Range, Lichen Peak, *P. Siple & S. Corey 73-1*, type.

PANNOPARMELIA **delicata** Dodge & Baker, sp. nov.

Pl. 63, fig. 417; pl. 64, figs. 419, 420, 423.

Type: Marie Byrd Land, Edsel Ford Range, Lichen Peak, *P. Siple & S. Corey 73-1.*

Thallus ad 1 cm. diametro, laciniatus, laciniae 0.3–0.6 mm. latitudine, subdichotome vel irregulariter ramosae, apicibus rotundatis, albidus dein griseus et obscurascens; cortex superior 7–10 μ crassitudine, gelifactus amorphusque; algae rarae, protococcoideae, 5–6 μ diametro sub cortice, sparsae; medulla 55–60 μ crassitudine, arachnoideae, hyphis 2–3 μ diametro, reticulatim dispositis; cortex inferior 10–15 μ, gelifactus, hyphis periclinalibus; rhizinae cylindricae, 40–45 μ diametro, hyphis longitudinalibus, 2 μ diametro, conglutinatis, hyalinis, exteris subbrunnescentibus, reticulatim anastomosantes.

Apothecia sessilia, subterminalia?, 160–170 μ diametro, marginata; cortex 5–7 μ, gelifactus; amphithecium 20–25 μ crassitudine, hyphis tenuibus reticulatim dispositis; hypothecium 7–10 μ, hyphis tenuibus periclinalibus, hyalinum, gelifactum; thecium 30 μ altitudine; paraphyses tenues, gelifacti; asci cylindrici; ascosporae

sphericae, unicellulares, 3 μ diametro. Thecium evanescens; soredia subspherica, 30 μ diametro, cellulis 4–6 algarum pseudoparenchymatice corticatis amphithecium implentia.

Thallus up to 1 cm. in diameter, laciniae 0.3–0.6 mm. broad, subdichotomously or irregularly branched, tips rounded, white, then gray and darkening, opaque; upper cortex 7–10 μ thick, deeply staining but gelified and amorphous; algae very rare, protococcoid, 5–6 μ in diameter; medulla 55–60 μ thick, arachnoid, of reticulately arranged hyphae 2–3 μ in diameter; lower cortex 10–15 μ thick, gelified, of periclinal hyphae; rhizinae cylindric, 40–45 μ in diameter, of conglutinate longitudinal hyaline hyphae 2 μ in diameter, outer hyphae browning, anastomosing into a dense network which forms a hypothallus extending beyond the laciniae.

Apothecia sessile and apparently subterminal on the lobes, 160–170 μ in diameter, marginate; cortex 5–7 μ thick, deeply staining and completely gelified; amphithecium 20–25 μ thick, of slender hyphae in a network, much as in the medulla; hypothecium 7–10 μ thick, of slender hyaline periclinal hyphae, gelified; thecium 30 μ tall; paraphyses slender, gelified; asci cylindric, 8-spored; ascospores spherical, unicellular, thin-walled, 3 μ in diameter.

In our material the thecium has largely disappeared and been replaced by a layer of spherical soredia 30 μ in diameter with 4–6 algal cells surrounded by a pseudoparenchyma. The characters of the thecium above reported are from a single portion remaining between two soredia. Even this portion has begun to gelify so that the height of the thecium may be too little. The thallus has apparently been invaded by the same dematiaceous fungus which is invading *P. pellucida* on the same rock, but the invasion is much less severe. There is sometimes a layer of large brownish obovoid cells just below the gelified upper layer (called cortex above). The interpretation is uncertain as the cells are not uniform in distribution. It is possible that they represent the terminal swollen cells of a fastigiate cortex such as has been reported in *P. anzioides*, and the gelified layer is a layer of dead cells so frequent in our Antarctic material. These swollen cells have also been seen

in the apothecium where one would expect cortical cells but here also their distribution is not uniform.

On sericite-orthoclase schist.

MARIE BYRD LAND: Edsel Ford Range, Lichen Peak, *P. Siple & S. Corey 73-1.*

PARMELIA

PARMELIA Acharius, Meth. Lich. 153. 1803.

Imbricaria Acharius, K. Vetensk. Akad. Nya Handl. **15**: 250. 1794; Michaux, Fl. Bor.-Am. **2**: 322. 1803; Lamarck & DeCandolle, Fl. Franç. ed. 3. **2**: 385. 1805.

Physcia S. F. Gray, Nat. Arr. Brit. Pl. **1**: 455. 1821, non Schreber, 1791.

The selection of a type species of this very large and variable genus is very difficult. When originally proposed, it included most of the foliose members of the lecanorine series. Each successive treatment by Acharius removed sections and species to other genera. Of the original species surviving in his last treatment of the genus in 1814, most remain in the genus as it is commonly understood today. If we exclude the doubtful species and the species subsequently taken as types of other genera or closely related to them, e. g., *Omphalodium* Meyen & Flotow, Nova Acta Acad. Leopold. Carolin. **19**: Suppl. 223. 1843, based on *O. pisacomense* Meyen & Flotow, includes *O. hottentotta* (Ach.) Meyen & Flotow; *Parmotrema* Massalongo, Atti. I.R.Ist. Veneto III. **5**: 248. 1860, based on *P. perforata* (Wulfen apud Jacquin) Mass. and including *Parmelia perlata* (Hoffm.) Ach. and *P. caperata* (L.) Ach.; *Pseudoevernia* Zopf, Beih. z. bot. Centralbl. **16**: 124. 1903, based on *P. furfuracea* (L.) Zopf; sect. *Melaenoparmelia* Hue, Nouv. Arch. Mus. IV. **1**: 138. 1899, based on *P. stygia* (L.) Ach. and including *P. olivacea* (L.) Ach.; *Xanthoparmelia* Vainio, Étude Lich. Brésil **1**: 60. 1890, based on *P. conspersa* Ach., etc., and including *P. centrifuga* (L.) Ach., we are left with two groups of four species each. The subgenus *Hypogymnia* includes one group: *P. encausta* (Sm.) Ach., *P. intestiniformis* (Vill.) Ach., *P. lophyrea* Ach., and *P. physodes* (L.) Ach. The remaining four species—*P. omphalodes* (L.) Ach., *P. saxatilis* (L.) Ach., *P.*

scortea Ach., and *P. tiliacea* Ach.—are commonly placed in *Euparmelia* sect. *Hypotrachynae.* A species selected from the latter group would conserve the name for the larger number of species.

We have been unable to consult the original publication cited for *Imbricaria.* Acharius used it as a subgenus in 1798 and abandoned it in all his subsequent treatments. For *Imbricaria* Michaux cites only *I. convexiuscula (Anzia colpodes* (Ach.) Stiznbgr. fide Zahlbr., Cat. Lich. Univ. 6: 276. 1931), although *I. omphalodes* and *I. physodes* are mentioned without description. Lamarck & DeCandolle used it in the modern sense of *Parmelia,* but included some species of Collemaceae and Usneaceae.

Physcia S. F. Gray was based on *P. physodes* (L.) Gray, now placed in *Parmelia* sect. *Hypogymnia,* and *P. diatrypa* (Ach.) Gray, later made the type species of *Menegazzia.*

Thallus foliose, laciniate, lobes rounded, elongate, linear or filiform, appressed or ascending with more or less well-developed rhizinae, the lower surface rarely nude; upper cortex of simple or branched septate hyphae perpendicular to the surface, with small cells, upper surface often isidiose or sorediose; algae protococcoid; medulla loosely woven, occasionally with a central cavity, composed of thin or thick-walled periclinal hyphae; lower cortex usually dark. Apothecia sessile or short-stipitate on the upper surface, disc sometimes perforate; amphithecium well developed; epithecium amorphous; hypothecium hyaline with algae below; paraphyses imbedded in a gel, usually branched and septate; asci 2–8-spored; ascospores hyaline, unicellular, ellipsoidal, ovoid or spherical, thin-walled or with a thickened membrane. Spermogonia immersed in the surface of the thallus or in the amphithecium or ostiole protruding from a wart, spherical to ovoid, wall black above, brown or hyaline below; spermatiophores simple or sparingly branched, spermatia cylindric to fusiform.

The genus may be divided as follows:

Cortex appearing pseudoparenchymatous above and often extending the underside of the lobes for a short distance; lower cortex of compact slender, periclinal hyphae, or decomposed ....*Physcioideae*

Cortex of branched hyphae perpendicular to the surface of the thallus; cells more or less isodiametric, often giving the appearance of pseudoparenchyma on both upper and lower surfaces.

Nude below, without rhizinae.

Thallus perforate below; laciniae slender; apothecia 6–8-spored; ascospores not over 10 μ.

Medulla excavated .... *Hypogymnia*

Medulla solid .... *Allantoparmelia*

Thallus perforate above; asci 2–4-spored; ascospores relatively large .... *Menegazzia*

Rhizinae scanty; laciniae greenish brown to black; apothecia sessile .... *Melaenoparmelia*

Thallus with long coarse rhizinae to almost nude; laciniae slender, usually ascending, gray .... *Pseudoevernia*

Central portion of thallus rhizinose, margin nude, smooth but often ciliate; laciniae white, gray or yellowish; apothecia more or less stipitate.... .... *Parmotrema*

Thallus yellow .... *Subflavescentes*

Thallus white or gray .... *Subglaucescentes*

Thallus completely and densely rhizinose below; rhizinae next the margin often reduced to papillae; laciniae appressed .... *Euparmelia*

Laciniae yellow .... *Xanthoparmelia*

Laciniae white to gray or brownish .... *Hypotrachynae*

Laciniae di- or seldom trichotomously branched, slender, almost linear, tips truncate or notched .... *Sublinearis*

Laciniae irregularly branched, lobes of unequal width.

Tips usually rounded, or notched; apothecia sessile .... *Cyclocheila*

Tips usually more or less ascending; apothecia short-stipitate...... .... *Irregularis*

Several of the above subdivisions have already been segregated as genera but in the absence of a monographic treatment of the whole group the generic segregates have not been widely recognized.

The systematic position of much Antarctic material referred here is doubtful since much of the material is sterile. In view of the structure of the cortex, *Cornicularia lanata* v. *minuscula* Hue, excl. syn. is much better left in *Alectoria* or *Cornicularia* rather than referred to *Parmelia*.

The determination of *Parmelia saxatilis* (L.) Ach. from the Antarctic is extremely doubtful since the material is sterile and no microscopic details of the Antarctic plants are given. *P. quarta* Darb. belongs in *Omphalodium* (see p. 561) rather than in the section *Hypotrachynae* as catalogued by Zahl-

bruckner. *P. Gerlachei* Zahlbr. (*P. antarctica* Vainio non Bitter) belongs in the section *Xanthoparmelia*. *P. acervata* Hue seems more closely related to our species from Marie Byrd Land and is rather aberrant in its cortical structure from either the *Hypotrachynae* where it was placed by its author or the section *Melaenoparmelia* where it is catalogued by Zahlbruckner. Our species approach *Physcia* in the structure of the thallus and would be placed in that genus in the absence of apothecia. Since all the species of *Physcia* so far reported from the Antarctic have been small sterile thalli, it is quite possible that some of them may be found to belong in *Parmelia* when apothecia are found. We have preferred not to transfer them to *Parmelia* but have included members of both genera in the key on p. 584, based largely upon characters observable in the sterile thallus. Two of our own species are sterile but we have preferred to refer them to *Parmelia* in view of their similarity to the structure of our fertile species, recognizing that it may be necessary to transfer them to *Physcia*, should their apothecial characters when discovered, warrant such a transfer.

PARMELIA **leucoblephara** Dodge & Baker, sp. nov.

Type: Marie Byrd Land, Edsel Ford Range, Lichen Peak, *P. Siple & S. Corey 73-7*.

Thallus ad 0.8 cm. diametro, laciniae irregulariter ramosae, divaricatae, applanatae subconvexaeve, 0.2–0.3 mm. latitudine apicibus subtruncatis, laeves, albidae, marginibus laevibus cum ciliis longis, ramosis, albis dein fuscis; sorediis granulosis subisidiosisque, marginibus subelevatis; KOH flavescens; rhizinae elongatae, fuscae, non ramosae; cortex superior 15 μ crassitudine, fastigiatus, cellulis ellipsoideis, brunneis, 7–14 × 5.5–7 μ, strato gelifacto 7–8 μ crassitudine tectus; stratum gonidiale 20–30 μ crassitudine, cellulis protococcoideis, 5–7 μ diametro, singulis vel in coloniis parvis; medulla 55–60 μ crassitudine, hyphis tenuibus 1.5–2 μ diametro, laxissime implexis; cortex inferior 30 μ crassitudine, hyphis 1.5–2 μ, subbrunneis, laxe implexis, strato extero cellularum subsphericarum, 5.5–6 μ, brunnearum; rhizinae 40–60 μ diametro, hyphis longitudinalibus, strato extero brunneo.

Spermogonia immersa, subspherica, 55–70 μ, murus 7–9 μ crassitudine, cellulis pachydermaticis isodiametricis; spermatiophorae elongatae, tenues; spermatia bacilliformia, recta.

Thallus up to 0.8 cm. in diameter, laciniae irregularly branched, divaricate, flat or somewhat convex, white, smooth,

margins smooth, with long branched cilia, white then fuscous; soredia granulose and subisidiose with somewhat elevated margins; KOH yellowing; rhizinae long, fuscous and unbranched; upper cortex 15 μ thick, fastigiate, cells ellipsoid, brown, 7–14 × 5.5–7 μ, covered by a gelified layer 7–8 μ thick; algal layer 20–30 μ thick, cells protococcoid, 5–7 μ in diameter, single or in small colonies; medulla 55–60 μ thick, of slender hyphae 1.5–2 μ in diameter, very loosely woven; lower cortex 30 μ thick, of brownish hyphae 1.5–2 μ, loosely woven with an outer layer of subspherical brown cells 5.5–6 μ in diameter; rhizinae 40–60 μ in diameter, of longitudinal hyphae with an outer brown layer.

Spermogonia immersed, subspherical, 55 × 70 μ, wall 7–9 μ thick, of isodiametric thick-walled cells; spermatiophores long, slender; spermatia bacilliform, straight.

Growing loose over mosses, *Grimmia Antarctici*, over granodiorite and biotite-sericite and sericite-orthoclase schist.

Marie Byrd Land: Edsel Ford Range, Lichen Peak, *P. Siple & S. Corey 73-1, 73-7*, type; Chester Mts., *P. Siple & S. Corey 97A-1*; Mt. Donald Woodward, *P. Siple, F. A. Wade, S. Corey & O. D. Stancliff DW-4.*

Parmelia **variolosa** Dodge & Baker, sp. nov.

Pl. 50, figs. 192–201.

Type: Marie Byrd Land, Edsel Ford Range, Mt. Rea-Cooper, *P. Siple, F. A. Wade, S. Corey & O. D. Stancliff R-1.*

Thallus ad 2 cm. diametro, laciniae convexae, 0.6–0.8 mm. latitudine, dichotome ramosae, apicibus truncatis, laeves, pruinosae, primulino-flavae raro sordidescentes; soralia magna, granulosa, KOH addito flavescentia; cortex superior 5–20 μ crassitudine, cellulis isodiametricis laxe dispositis, strato cellularum emortuarum 5–15 μ crassitudine tectus; algae 7–9 μ diametro, protococcoideae, paucae, sparsae; medulla 500–600 μ crassitudine, hyphis 2–4 μ diametro, laxe reticulatimque dispositis; cortex inferior 40–60 μ crassitudine, hyphis obscuris pachydermaticis; rhizinae ad 1100 μ diametro, hyphis obscuris longitudinalibus, exteris pachydermaticis.

Apothecia ad 0.5 mm. diametro, marginata, rufo-brunnea aut grisea, sessilia, rara; amphithecium 50–80 μ crassitudine, cortex 20 μ, decompositus, raro subfastigiatus; parathecium non evolutum; hypothecium 10–20 μ crassitudine, hyalinum, hyphis tenuibus dense reticulatis; thecium 50–60 μ altitudine; paraphyses 1 μ diametro, apicibus subinflatis vaginatis, ad 3.5 μ diametro, recti, hyalini; asci 50–63 × 10–15 μ, elongato-clavati, vaginati; ascosporae octonae, 9–11 × 4.5–6 μ, late ellipsoideae vel subreniformae, hyalinae.

Spermogonia 70 × 90 μ, ampulliformia, murus obscuro brunneus, cellulis isodiametricis parvis pachydermaticis; spermatia 1–1.5 μ longitudine, recta, tenuia.

Thallus up to 2 cm. in diameter, laciniae convex, 0.6–0.8 mm. broad, dichotomously branched, tips truncate, smooth, pruinose, primuline yellow rarely graying; soralia large, granular, KOH yellow; upper cortex 5–20 μ thick, rather loosely pseudoparenchymatous, covered by a gelified layer 5–15 μ thick, thicker where the cortex is thin and vice versa; algae 7–9 μ in diameter, protococcoid, few, small, scattered in the upper portion of the medulla which is 500–600 μ thick, of loosely reticulate hyphae 2–4 μ in diameter; lower cortex 40–60 μ thick, of very dark, sometimes black, hyphae, more or less fibrous in arrangement with here and there abundant groups of cut ends of hyphae running at right angles to the others; rhizinae common, up to 1100 μ in diameter, of dark fibrous hyphae with an outer layer identical and continuous with that of the thallus, about 10 μ thick. The tips of the lobes have a cortex thicker than the upper one, about 30–40 μ thick.

Apothecia up to 0.5 mm. in diameter, more or less circular, with a prominent margin, reddish brown to gray and concolorous with the thallus, sessile, very rare; amphithecium 50–80 μ thick, cortex about 20 μ, mostly decomposed, occasionally somewhat fastigiate; parathecium not developed; hypothecium 10–20 μ thick, hyaline, of slender densely reticulate hyphae; thecium 50–60 μ tall; paraphyses about 1 μ in diameter, with slightly enlarged apical cells surrounded by a gelified sheath 3.5 μ in diameter, mostly straight, rarely branched, not darkened; epithecium 5–10 μ thick, light brownish; asci 50–63 × 10–15 μ, elongate-clavate, with a prominent sheath and an umbonate end to the protoplasmic content, 8-spored; ascospores 9–11 × 4.5–6 μ, broadly ellipsoidal to somewhat reniform, hyaline.

Spermogonia frequent, 70 × 90 μ, flask-shaped, with a dark brown wall of thick-walled, small, isodiametric cells; spermatia 1–1.5 μ long, very slender and straight.

On dark greenish gray slate and growing over mosses, *Grimmia Antarctici.*

The apothecia are extremely rare, and it is difficult to establish their identity with the thallus. Apparently in the apothecial regions the thallus enlarges, becomes distorted, and more floccose with an increased algal content (pl. 50, fig. 198).

MARIE BYRD LAND: Edsel Ford Range, Mt. Rea-Cooper, *P. Siple, F. A. Wade, S. Corey & O. D. Stancliff R-1*, type; Lichen Peak, *P. Siple & S. Corey 73-1, 73-4*; Skua Gull Peak, *P. Siple & S. Corey 72W-3, 72W-4, 72W-6, 72W-14, 72W-15*.

PARMELIA **Coreyi** Dodge & Baker, sp. nov.

Pl. 50, figs. 202–204.

Type: Marie Byrd Land, Edsel Ford Range, Skua Gull Peak, *P. Siple & S. Corey 72W-3.*

Thallus fragilis, laciniatus, lobis convexis, 0.4–0.5 mm. latitudine, apicibus flabellatis, 0.8–1.0 mm. latitudine, excisis, apicibus lacinularum rotundatis, laevis, pruinosus, raro erosus granulosusque, griseus obscurascensque, KOH addito flavescens; cortex superior 10–20 μ, fastigiatus, cellulis ellipsoideis, 5.5–7 × 4–5 μ, compactioribus quam in *P. variolosa*, exteris obscuris, strato gelifacto 7–10 μ crassitudine tectus; stratum gonidiale 30–35 μ crassitudine, cellulis ad 10 μ diametro, protococcoideis; medulla 700–1000 μ crassitudine, hyphis subbrunneis laxe implexis; cortex inferior 20–30 μ crassitudine, fibrosus, laxior quam in *P. variolosa;* rhizinae 700–1000 μ diametro, ramosae, hyphis densissime compactis longitudinalibus, cortex ad 10 μ crassitudine, cellulis brevibus pachydermaticis obscuris.

Apothecia ad 0.5 mm. diametro, marginata, rara, brunnea, sessilia; hypothecium hyalinum; thecium 45–55 μ altitudine; paraphyses 1–1.5 μ diametro, septati, apicibus subinflatis, vaginatis ad 3.5 μ diametro, brunneis, epithecium 5–10 μ crassitudine, brunneum, gelifactum; asci 42–50 × 10.5–13 μ, late clavati, apice protoplasmatis umbonata, vaginati; ascosporae octonae, 10.5–14.5 × 3.5–4.5 μ, elongato-ellipsoideae aut subreniformes, hyalinae.

Spermogonia 55 × 70 μ, subspherica, murus hyalinus, spermatiophorae crassiores, septatae.

Thallus fragile, laciniae convex, 0.4–0.5 mm. broad, tips flabellate, 0.8–1.0 mm. broad, sinuses excised, tips of lacinulae rounded, smooth, pruinose, rarely eroded, granulose, gray and darkening, KOH yellow; upper cortex 10–20 μ thick, fastigiate, of ellipsoidal cells 5.5–7 × 4–5 μ, loosely packed but much more closely than in *P. variolosa*, upper cells darkened, covered by a gelified layer 7–10 μ thick; algal layer 30–35 μ thick, cells up to 10 μ in diameter, protococcoid, quite abundant; medulla 700–1000 μ thick, of loosely woven hyphae somewhat brownish throughout; lower cortex 20–30 μ, less compact than in *P. variolosa*, only the outer cells darkened, more or less fibrous; rhizinae numerous, 700–1000 μ in diameter, branched, dark brown on the outside, cortex up to 10 μ thick, of dark short thick-walled cells, the rest of densely packed longitudinal hyphae.

Apothecia up to 0.5 mm. in diameter, rarely with a promi-

nent margin, brown, sessile; hypothecium hyaline; thecium 45–55 μ tall; paraphyses 1–1.5 μ in diameter, rarely branched, septate, the terminal cells enlarged, surrounded by a large gelified sheath up to 3.5 μ in diameter, brown at maturity, epithecium 5–10 μ thick, brownish, gelified; asci 42–50 × 10.5–13 μ, broadly clavate, protoplasmic contents with a small umbonate apex, sheath moderately developed, 8-spored; ascospores 10.5–14.5 × 3.5–4.5 μ, elongate-ellipsoidal to subreniform, hyaline.

Spermogonia about 55 × 70 μ, subspherical, the walls not darkened, imbedded in the thallus, spermatiophores thick, closely septate.

Growing over mosses on sandy loam.

Due to the rarity of the apothecia, they were not imbedded and sectioned in this species. All microscopic details are from crushed mounts.

Marie Byrd Land: Edsel Ford Range, Lichen Peak, *P. Siple & S. Corey 73-1*; Skua Gull Peak, *P. Siple & S. Corey 72W-2, 72W-3*, type, *72W-4, 72W-7, 72W-9, 72W-13, 72W-14*.

Parmelia **griseola** Dodge & Baker, sp. nov.

Pl. 50, figs. 205–208.

Type: Marie Byrd Land, Edsel Ford Range, Skua Gull Peak, *P. Siple & S. Corey 72W-3*.

Thallus ad 1 cm. diametro, laciniae lineares, convexae, dichotome ramosae, 0.2–0.3 mm. latitudine, pruinosae erosaeque, pallide olivaceo-alutaceae dein griseae obscurascentesque, KOH addito rufescentes; cortex superior 20–40 μ crassitudine, pseudoparenchymaticus, cellulis circa 4 μ diametro, leptodermaticis, strato gelifacto 5–10 μ crassitudine tectus; stratum gonidiale 30–50 μ crassitudine, cellulis protococcoideis, ad 10 μ diametro; medulla 50–80 μ crassitudine, hyphis 2 μ diametro, laxe implexis, densioribus ad corticem inferiorem; cortex inferior 20–30 μ crassitudine, fibrosus, cellulis 1–3 μ diametro, exteris obscurascentibus; rhizinae ramosae, 500–800 μ diametro, cellulis 1.5–2 × 20 μ, cortex 5 μ crassitudine, cellulis 2–4 × 4.5–9 μ. Sterilis.

Thallus up to 1 cm. in diameter, laciniae linear, convex, dichotomously branched, 0.2–0.3 mm. broad, pruinose and eroded, pale olive buff then graying and darkening, KOH rufescent; upper cortex 20–40 μ thick, pseudoparenchymatous, in some places the outer cells darkened, in others not, of thin-walled cells about 4 μ in diameter, covered by a gelified layer

5–10 μ thick over the darkened areas, less developed over the lighter areas; algal layer up to 30–50 μ thick, cells up to 10 μ in diameter, protococcoid, abundant, some imbedded in the cortex; medulla 50–80 μ thick, of slender hyphae about 2 μ in diameter, loosely woven, becoming more or less fibrous at the junction with the lower cortex which is 20–30 μ thick, fibrous, hyphae 1–3 μ in diameter, only the outer ones darkened; rhizinae frequent, branched, 500–800 μ in diameter, of dark cells 1.5–2 × 20 μ, longitudinally arranged, covered by a cortex about 5 μ thick of short, thick-walled dark cells 2–4 × 4.5–9 μ, progressively longer and thinner within. Sterile.

On dark greenish gray slate and growing over mosses on sandy loam.

MARIE BYRD LAND: Edsel Ford Range, Skua Gull Peak, *P. Siple & S. Corey 72W-3*, type, *72W-9*, *72W-15*.

USNEACEAE

Thallus fruticose, erect, prostrate or pendent, attached to the substrate by a hapteron, radiate, corticate, with longitudinal hyphae (in *Alectoria)* or more usually a palisade of pseudoparenchyma; algae *Protococcus;* medulla dense and horny to cartilaginous or arachnoid, of longitudinal hyphae. Apothecia circular, plane or saucer-shaped, sessile or stalked; amphithecium well developed; asci 1–8-spored; ascospores hyaline or rarely brown, unicellular to muriform, thin-walled.

KEY TO ANTARCTIC GENERA

Cortex strengthened by strands of mechanical tissue; medulla arachnoid; spores 2-celled..*Ramalina*
Medulla uniform, arachnoid or horny-cartilaginous.
  Cortex of longitudinal hyphae; thallus hollow........................*Alectoria*
  Cortex a palisade of pseudoparenchyma, chondroid axis well developed and central.
    Thallus low, podetiiform to coralloid..............................*Siphula*
    Thallus fruticose, radial in structure; medulla easily separable from the cortex..*Usnea*

Only *Alectoria* and *Usnea* sect. *Neuropogon* have been found in our region; the other genera are represented by one or two species each in the Antarctic Archipelago.

ALECTORIA

ALECTORIA Acharius, Lichenogr. Univ. 120. 1810.

The type species was not designated. Since all the species of Acharius' treatment have been reduced or transferred elsewhere, except *A. jubata* (L.) Ach. and *A. sarmentosa* Ach., and since the former was taken as the type of *Bryopogon* Link, which is often considered a separate genus, Clements & Shear (Gen. Fung. 322. 1931) chose as a type *A. sarmentosa* Ach. as it belongs in the section *Eualectoria* Th. Fries.

Thallus pendulous, prostrate or somewhat erect, attached by a hapteron, round or somewhat flattened, seldom angular, radiate, often black; cortex horny, of longitudinal gelified hyphae; algae *Protococcus*; medulla of longitudinal hyphae, center usually hollow or arachnoid; pseudocyphellae or soralia frequent. Apothecia lateral on short branches; amphithecium usually well developed, margin naked or ciliate, sessile or almost stalked, saucer-shaped, absent in our species; disc brown to black; hypothecium hyaline, resting on the algal layer; paraphyses branched and anastomosing; asci 4–8-spored; ascospores unicellular, ellipsoid, hyaline or brown, thin-walled. Spermogonia immersed in small warts, spermatiophores little-branched, septate; spermatia short, straight, somewhat thickened at each end.

The genus is usually divided into two sections sometimes recognized as genera: *Bryopogon,* thallus bright or dark, medulla hollow in the center, asci 8-spored, ascospores hyaline; and *Eualectoria,* thallus not black, medulla arachnoid, asci 4-spored, spores brown. While the species so far reported from Antarctica are sterile, they seem to belong in section *Bryopogon* as does our single fertile species.

Since *A. antarctica* is unique in the family in lacking an amphithecium, it might be considered the type of a new genus and family in the lecideine series of families, representing a higher state of development from the Phyllopsoraceae. In all of its other characters it agrees with *Alectoria* sect. *Bryopogon,* and we prefer to leave it in this genus as is done in case of the few species of *Stereocaulon* of the section *Lecanocaulon* with lecanorine apothecia in an otherwise lecideine family.

KEY TO ANTARCTIC SPECIES

Thallus pale rufous, base fuscous, erect, flattened, variously long-perforate, granulose-sorediate; ecorticate; algae 10–20 (–28) μ .... *A. corymbosa*
Thallus black, prostrate, terete, not perforate; corticate, esorediose; algae 6–18 μ.
Branches erect or incurved, ramuli spinulose, surface smooth or nodulose; cortex 10–20(–30) μ; hyphae 8–18 μ .... *A. nigerrima*
Branches dichotomous or variously divaricate and intricate.
Ramuli capilliform, fibrillose; cortex 20–40 μ; hyphae 10–12 μ ..... *A. intricata*
Ramuli obtuse or acute but never capilliform; cortex 10–15 μ ..... *A. antarctica*
Tips short-digitate; cortical hyphae 4–6 μ .... *A. minuscula*

ALECTORIA **antarctica** Dodge & Baker, sp. nov.
Pl. 51, figs. 209–216.

Type: Marie Byrd Land, Edsel Ford Range, Mt. Rea-Cooper, *P. Siple, F. A. Wade, S. Corey & O. D. Stancliff R-1*

Thallus radiatus, ramosissimus, dichotomus, apicibus obtusis subacutisve, non attenuatis, niger; cortex 10–15 μ crassitudine, irregularis, hyphis longitudinalibus pachydermaticis, exteris nigris, interis hyalinis, 3–5 μ diametro; algae ad 8 μ diametro, protococcoideae, rarae, sparsae; medulla 100–200 μ diametro, centro aperto, sine axi chondroideo, hyphis 2 μ diametro, longitudinaliter aut irregulariter implexis.

Apothecia ad 0.7 × 0.45 mm., sessilia, nigra, convexa, carbonacea; amphithecium deest; parathecium 20–25 μ crassitudine, obscure fuscum, pseudoparenchymaticum; hypothecium hyalinum vel dilute brunneum; thecium 35–40 μ altitudine; paraphyses 1 μ diametro, pauci, septati, non capitati, ramosi vel non, hyalini; epithecium 10–15 μ, hyalinum, KOH–; asci 32–36 × 13–15 μ, late clavati, vaginati; ascosporae octonae, 6–7 × 3–3.5 μ, ellipsoideae, hyalinae.

Thallus radiate, much branched, dichotomous, the ends blunt to pointed but never extremely attenuated, entirely black; cortex 10–15 μ thick, irregular, of longitudinal hyphae appearing pseudoparenchymatous in cross-section, thick-walled, outside black becoming progressively lighter toward the center, 3–5 μ in diameter; algae up to 8 μ in diameter, protococcoid, few, scattered; medulla 100–200 μ in diameter, the center open and lacking a chondroid axis, of irregularly woven hyphae about 2 μ in diameter, mostly longitudinal, sometimes amorphous.

Apothecia up to 0.7 × 0.45 mm., black, sessile, convex, carbonaceous; amphithecium lacking; parathecium 20–25 μ thick, dark fuscous, pseudoparenchymatous, merging laterally with the thalline cortex; hypothecium hyaline to pale brownish; thecium 35–40 μ tall; paraphyses about 1 μ in diameter, very

few, septate, branched or unbranched, heads scarcely expanded, not darkened; epithecium 10–15 μ, hyaline, KOH–; asci 8-spored, 32–36 × 13–15 μ, broadly clavate, with a prominent gelified sheath; ascospores 6–7.5 × 3–3.5 μ, ellipsoidal, hyaline.

On coarse-grained leucogranite, granodiorite, pink granite, deep olive-buff granite, sandy loam, biotite-sericite-orthoclase schist, and fine-grained dike.

KING EDWARD VII LAND: Rockefeller Mts., Mt. Helen Washington, *P. Siple, F. A. Wade, S. Corey & O. D. Stancliff HW-2, HW-6, HW-9, HW-10, HW-13, HW-14.*

MARIE BYRD LAND: Edsel Ford Range, Mt. Rea-Cooper, *P. Siple, F. A. Wade, S. Corey & O. D. Stancliff R-1,* type, *R-4, R-7;* Mt. Grace McKinley, *P. Siple, F. A. Wade, S. Corey & O. D. Stancliff McK-5, McK-6, McK-10;* Mt. Corey, *P. Siple & S. Corey 112E-2;* Haines Mts., *P. Siple & F. A. Wade H-2;* Lichen Peak, *P. Siple & S. Corey 73-1, 73-2, 73-6;* Skua Gull Peak, *P. Siple & S. Corey 72W-11, 72W-12, 72W-13, 72W-14;* Chester Mts., *P. Siple & S. Corey 97A-1;* Mt. Donald Woodward, *P. Siple, F. A. Wade, S. Corey & O. D. Stancliff DW-5;* Mt. Stancliff, *P. Siple & S. Corey 72A-1.*

S. VICTORIA LAND: Queen Maud Mts., Durham Point at northeast portal of Thorne Glacier, *Q. A. Blackburn, R. S. Russell Jr. & S. D. L. Paine QM-5.*

USNEA

USNEA Wiggers, Primit. Fl. Holsat. 90. 1780.

The type species is *Usnea florida* (L.) Wigg.

Thallus fruticose or filamentous, very rarely of a single branch, usually of several compound branches, dichotomous or subdichotomous, more rarely sympodially branched, from 1 cm. to 7 m. or more long, erect, pendulous or prostrate, base attached to the substrate; branches thicker at the base, thinning very much toward the apex, 0.2–7 mm. thick, terete, angled or longitudinally sulcate, foveolate and scrobiculate, smooth or tuberculate, verrucose or spinuliferous, continuous, areolate or annulate; cortex coriaceous or somewhat spongy, of densely woven, thick-walled, conglutinate hyphae, in a few species almost evanescent on the primary branches; algae *Protococcus;* medulla distinct although often thin, of thin-walled hyphae, very rarely with scattered colonies of algae; chondroid axis single, percurrent, of longitudinal thick-walled hyphae usually very solid, rarely lacerate with a loosely woven center.

Apothecia lecanorine, constricted at the base, lateral, rarely subterminal or terminal, margin evanescent or indistinct, nude or ciliate; asci subcylindric or slightly inflated; spores typically 8 per ascus, simple, hyaline, ellipsoidal, epispore distinct; paraphyses conglutinate, septate, branched, epithecium with distinct granules. Spermogonia rarely present, pale or slightly darkened, immersed in tubercles; spermatia straight with one end slightly thicker.

The genus is divided into six subgenera of which only *Neuropogon*, sometimes recognized as a genus, is typically Antarctic. All its species are confined to the Southern Hemisphere except *U. sulphurea*, which ranges from Patagonia northward in elevations above 3000 m. in the American tropics to the Arctic.

NEUROPOGON

NEUROPOGON Nees & Flotow, Linnaea 9: 496. 1835, pr. p.

Usnea sect. *Neuropogon* Mont. ap. Gay, Hist. Fis. Polit. Chile, Bot. 8: 67. 1852, pr. p.

Usnea subgenus *Neuropogon* Motyka, Lich. Gen. Usnea Stud. Monogr. Syst. 1: 18. 1936.

Thallus short, not reaching 10 cm., fruticose, erect, branched, almost wholly saxicolous, sulphur yellow, orange, or orange red, tips and cilia of apothecia commonly black or whole thallus black or black variegated. Apothecia terminal or lateral, eciliate or rarely ciliate.

KEY TO ANTARCTIC SPECIES

Thallus sorediate, usually sterile.
- Soralia eroded, not in tubercles; thallus usually smooth except for soredia.. .... *U. antarctica*
- Soralia in tubercles, not conspicuously eroded.
  - Thallus foveolate to rugose.......... *U. frigida*
  - Thallus papillate.......... *U. granulifera*

Thallus not sorediate, usually fertile, grossly tuberculate-papillate.
- Thallus almost eciliate, tips rather thick, usually fasciate; medulla fairly dense, KOH almost negative, axis horny or chondroid and subpellucid, then slightly fuscous and glassy.......... *U. fasciata*
- Thallus tips frequently divaricate-branched and appearing ciliate, slender; medulla thin, rather loose, axis opaque, white but not horny..... *U. striguloso*

Usnea antarctica DuRietz, Svensk Bot. Tidskr. **20**: 90, 93. 1926. Pl. 51, figs. 217–222.

Neuropogon Taylori Blackman, Rept. Coll. Nat. Hist. Antarctic Voy. Southern Cross 1898–1900. 320. 1902, non Hook. f. & Taylor, London Jour. Bot. **3**: 657. 1844.

Usnea sulphurea f. *sphacelata* Th. Fr., Nyt Mag. Naturvidensk. **40**: 208. 1902, non *Usnea sphacelata* R. Brown, Capt. Parry's Voy. Nat. Hist. Suppl. Append. cccvii. 1824.

Neuropogon melaxanthum Darbishire, Nat. Antarct. [Discovery] Exp. Nat. Hist. **5**: 7. 1910; Brit. Antarct. [Terra Nova] Exp. Bot. 58. 1923, excl. syn.

Type: South Victoria Land, Geikie Land, 71° 40′ S., 170° E., Admiralty Range, 700 m., *C. E. Borchgrevink*, in Bot. Mus. Univ. Upsala.

Thallus erect or prostrate, fruticose, 3–5 cm. tall, sparingly branched, eramulose, rigid, sorediose, straw-color, yellowing, tips black or with black bands, or completely blackened, smooth or somewhat shining; base thick, up to 1.5 mm., rigid and firm, sparsely sympodially or dichotomously branched above, branches slightly attenuate at the base and subulate-attenuate at the tips, usually almost simple or branched below the tips, terete, glabrous, shining, smooth or very indistinctly papillate above, sometimes subfoveolate, lateral branches rare, somewhat constricted at the base, ascending, appressed; cortex thin, about 60 μ thick, almost horny, yellow without, of fastigiate pseudoparenchyma, cells thin-walled, up to 7 μ in diameter; algae protococcoid, cells up to 8 μ in diameter, scattered in the medulla which is thin, 80–100 μ, dense, white, KOH–, of smooth hyphae 1.5–3.5 μ in diameter, branched and anastomosed, irregularly woven in a close network, denser next the cortex, looser next the medulla; chondroid axis about 450 μ, horny, slightly fuscous, of closely packed, longitudinal hyphae 1 μ in diameter, thin-walled, cells 25–30 μ long.

Sterile. Soredia frequent in the upper portions, granulose-farinose, white or finally blackened, soralia deeply eroded, or at least not in tubercles.

Growing on granodiorite, sericite schist, and pink granite.

MARIE BYRD LAND: Edsel Ford Range, Mt. Grace McKinley, *P. Siple, F. A. Wade, S. Corey & O. D. Stancliff McK-1*; Haines Mts., *P. Siple & F. A. Wade H-3*; Skua Gull Peak, *P. Siple & S. Corey 72W-10, 72W-18*; Mt. Corey, *P. Siple & S. Corey 112E-2.*

KING EDWARD VII LAND: Rockefeller Mts., Mt. Helen Washington, *P. Siple, F. A. Wade, S. Corey & O. D. Stancliff HW-6, HW-13.*

S. VICTORIA LAND: Geikie Land, Admiralty Range, 700 m., 71° 40′ S., 170° E., *C. E. Borchgrevink.* Motyka also cites 71° 30′ S., 300 m., *C. E. Borchgrevink*; Cape Adare, *Scott*; Cape Sustruzi, Evans Cove, Brit. Antarct. [Terra Nova] Exp., *Scott*; Darbishire adds. Mt. Terror, Nat. Antarct. [Discovery] Exp., *E. A. Wilson*, and Cape Boyds, 500 m., *H. T. F.*

USNEA **frigida** Dodge & Baker, sp. nov. Pl. 51, figs. 223–225.
Type: Marie Byrd Land, Edsel Ford Range, Mt. Rea-Cooper, *P. Siple, F. A. Wade, S. Corey & O. D. Stancliff R-1.*

Thallus erectus aut prostratus, fruticosus, 3–5 cm. altitudine, ramosus, eramulosus, rigidus, nitidus, niger, raro basi flavus, laevis, ad 0.7 mm., apicibus non attenuatis, teres, glaber, rugosus aut foveolatus, non dichotome ramosus, ramis non basi attenuatis, divaricatis; cortex 20–30 μ crassitudine, obscurus vel niger extus, dilutior intus, cellulis 4–6 μ diametro, isodiametricis; algae protococcoideae, ad 10 μ diametro, sub cortice in medulla sparsae; medulla 50–60 μ crassitudine, hyphis laxissime implexis, pachydermaticis, 2–4.5 μ diametro, ramosis anastomosantibusque; axis chondroideus ellipticus, 60 × 80 μ, hyphis longitudinalibus, densissimis, hyalinis.

Soralia tuberculata, hemispherica, raro longitudinaliter elongata vel irregularia, non erosa, nigra juventute dein sordide grisea subflavidave.

Thallus erect or prostrate, fruticose, 3–5 cm. tall, branched, eramulose, rigid, shining, black, rarely yellow at the smooth base, up to 0.7 mm. in diameter, tips acute but not attenuate, terete, glabrous, rugose or foveolate, not dichotomously branched, divaricate, branches not attenuate at the base; cortex 20–30 μ thick, dark or black on the outside, lighter within, pseudoparenchymatous, cells 4–6 μ in diameter; algae protococcoid, up to 10 μ in diameter, scattered in the medulla below the cortex; medulla 50–60 μ thick, of loosely woven thick-walled hyphae 2–4.5 μ in diameter, branched and anastomosing; chondroid axis elliptic in cross-section, 60 × 80 μ, of densely packed, longitudinal hyaline hyphae.

Soralia tuberculate, hemispheric, rarely longitudinally elongate or irregular, not eroded, black when young, becoming dirty gray or yellowish.

On coarse pink leucogranite, sericite-orthoclase schist, orthoclase-sericite-siderite schist, and fine-grained dike, also sandy loam.

This species seems intermediate between *U. antarctica* DR. and *U. granulifera*, the branches being more foveolate than the former and not papillate as in the latter. The soralia are close to the latter, which has been reported from the Graham Land Archipelago, South Victoria Land, 71° 18′ S., Heard Island (Deutsch. Südpol. Exp.), and Kerguelen.

KING EDWARD VII LAND: Rockefeller Mts., Mt. Helen Washington, *P. Siple, F. A. Wade, S. Corey & O. D. Stancliff HW-2, HW-7, HW-10, HW-11, HW-15, HW-17, HW-18.*

MARIE BYRD LAND: Edsel Ford Range, Mt. Grace McKinley, *P. Siple, F. A. Wade, S. Corey & O. D. Stancliff McK-1, McK-5, McK-6, McK-10;* Mt. Donald Woodward, *P. Siple, F. A. Wade, S. Corey & O. D. Stancliff DW-1, DW-2;* Mt. Rea-Cooper, *P. Siple, F. A. Wade, S. Corey & O. D. Stancliff R-1,* type, *R-2, R-3;* Lichen Peak, *P. Siple & S. Corey 73-1;* Skua Gull Peak, *P. Siple & S. Corey 72W-7, 72W-10, 72W-18;* Mt. Corey, *P. Siple & S. Corey 112E-1.*

BLASTENIACEAE

Thallus crustose, uniform, effigurate, small-foliose or dwarf-fruticose, attached to the substrate by hyphae of the prothallus or of the medulla, or by rhizinae in *Xanthoria*, heteromerous, rarely homoeomerous; ecorticate or fastigiate-corticate, the palisade sometimes forming a pseudoparenchyma, rarely corticate below (in *Xanthoria, Gasparrinia,* and *Kuttlingeria);* algae *Protococcus.* Apothecia round, sessile or immersed, either biatorine, lecideine, or lecanorine, usually with algal layer beneath the hypothecium; epithecium granular or powdery, usually containing chrysophanic acid which is colored purple or violet by KOH; paraphyses simple, septate, tips usually thickened; asci normally 8-spored; ascospores hyaline, thick-walled, polaribilocular (except in *Protoblastenia, Fulgensia,* and *Polycauliona Charcoti).*

KEY TO ANTARCTIC GENERA

Apothecia biatorine, but algae may occur beneath the hypothecium.
  Spores unicellular . . . . *Protoblastenia*
  Spores 2-celled.
    Thallus crustose, uniform, ecorticate . . . . *Blastenia*

Thallus effigurate, corticate.................................*Kuttlingeria*
Thallus fruticose..*Lethariopsis*
Spores 4-celled; tropical and subtropical......................*Xanthocarpia*
Apothecia lecideine; thallus crustose, uniform.........................*Huea*
Apothecia lecanorine.
Spores unicellular.
Thallus effigurate; mountains of temperate zone...................*Fulgensia*
Thallus dwarf-fruticose..........................*Polycauliona Charcoti*
Spores polaribilocular.
Thallus uniform, usually ecorticate..........................*Pyrenodesmia*
Thallus effigurate, usually corticate.........................*Gasparrinia*
Thallus dwarf-fruticose.......................................*Polycauliona*
Thallus small-foliose, corticate below with rhizinae.............*Xanthoria*
Spores 3-celled, protoplasts nearly spherical, connected by isthmi; mostly tropical...*Triophthalmidium*

We have considered *Xanthoria* is better placed in the Blasteniaceae rather than in the Teloschistaceae, since its structure agrees much more closely with this family than with *Teloschistes.* Also there are several transitional species. *Lethariopsis* of the Antarctic Archipelago seems to be a more highly developed genus analogous to *Polycauliona* in the lecanorine series.

PROTOBLASTENIA

PROTOBLASTENIA Steiner, Verh. Zool.-Bot. Ges. Wien **61**: 47. 1911.

Protoblastenia Zahlb. in Engler & Prantl, Die Nat. Pflanzenfam. I. 1*: 226. 1907 (as subgenus of *Blastenia).*

The type species is *P. rupestris* (Scopoli) Steiner.

Thallus crustose, uniform, ecorticate; algae *Protococcus.* Apothecia sessile or immersed, light or dark with well-developed parathecium; hypothecium light or dark; paraphyses simple, asci 8-spored; ascospores hyaline, unicellular. Spermatiophores closely septate, budding off short straight spermatia (arthrosterigmata of Nylander, endobasidial type of Steiner).

The species of this genus are separated from *Lecidea* sect. *Biatora* and *Lecanora* on the production of chrysophanic acid and the structure of the spermogonia.

PROTOBLASTENIA **flava** Dodge & Baker, sp. nov.

Pl. 52, figs. 226–229.

Type: King Edward VII Land, Rockefeller Mts., Mt. Helen

Washington, *P. Siple, F. A. Wade, S. Corey & O. D. Stancliff HW-8.*

Thallus granulosus, gelifactus madefactus, ceraceo-flavus vel primulino-flavus, KOH immutatus; cortex deest vel paucis cellulis fastigiatis lateraliter distributis; algae protococcoideae in coloniis parvis a cellulis compactis circumdatis, laxe dispositis insuper pluribus sed in thallo late dispositis; medulla reticulata, funiculis hypharum intertexta; stratum basale densius, paucis cellulis fastigiatis obscuris.

Apothecia ad 1.50 mm. diametro, circularia, convexa, laevia, sparsa vel gregaria, ceraceo-flava vel thallo immerso ochracea; parathecium ad 50 μ crassitudine, bene evolutum, hyphis minutissimis verticalibus densissimis gelifactis; hypothecium ad 75 μ crassitudine, hyalinum, hyphis ut in parathecio, pedem aut stipitem ad 150–200 μ longitudine, 100 μ latitudine inferne formans; thecium ad 150 μ altitudine; paraphyses 1 μ diametro, apicibus 1–3 μ diametro, septati, ramosi vel non ramosi, evaginati, epithecium ad 10 μ crassitudine, dilute brunneum, gelifactum; asci 38–67 × 8–16 μ, elongati, clavati, apicibus umbonatis, insuper vaginatis; sporae octonae, 9–13 × 3.5–6.5 μ, unicellulares, ellipsoideae vel raro subreniformes, centro subconstrictae.

Non-assimilative portions not represented; assimilative portions well developed over areas of several centimeters or reduced to scattered fragments on rocks, about mosses or gravel and debris, granulose, gelified when moist, wax yellow to primuline yellow; no reaction with KOH; cortex not developed or with occasional dark fastigiate strands on the sides; algae protococcoid in small colonies surrounded by compact hyphal cells, the individual masses loosely or not connected with the rest of the thallus, better distributed in the upper portion but occurring deep in the thallus; medulla open reticulate, the net composed of closely united strands of hyphae; basal portions somewhat denser with occasional dark fastigiate cells at the edges.

Apothecia up to 1.50 mm. in diameter, more or less circular, convex, smooth, scattered or gregarious, wax yellow to yellow ochre; parathecium up to 50 μ thick, well developed, of very minute dense, vertical, gelified hyphae; hypothecium up to 75 μ thick, hyaline, similar in structure to that of the parathecium, growing downward into a foot or stipe about 150–200 μ tall and 100 μ broad at the base; thecium up to 150 μ tall; paraphyses 1 μ in diameter, gradually expanding to the usually inflated tips 1–3 μ in diameter, septate, branched or unbranched, without a sheath, epithecium up to 10 μ thick, light brown, gelified; asci 38–67 × 8–16 μ, 8-spored, elongate-clavate, tips umbonate with a

prominent sheath above; ascospores 9–13 × 3.5–6.5 μ, 1-celled, ellipsoid to ovoid or sometimes slightly reniform, slightly constricted in the center.

Growing over mosses and sandy loam or on coarse-grained pink or greenish granite, granodiorite, and orthoclase-sericite-siderite schist.

KING EDWARD VII LAND: Rockefeller Mts., Mt. Helen Washington, *P. Siple, F. A. Wade, S. Corey & O. D. Stancliff HW-2, HW-3, HW-6, HW-7, HW-8*, type, *HW-9, HW-10, HW-12, HW-13, HW-15, HW-18.*

MARIE BYRD LAND: Edsel Ford Range, Mt. Rea-Cooper, *P. Siple, F. A. Wade, S. Corey & O. D. Stancliff R-2*; Mt. Stancliff, *P. Siple & S. Corey 72A-1*; Skua Gull Peak, *P. Siple & S. Corey 72W-7, 72W-13*; Lichen Peak, *P. Siple & S. Corey 73-3, 73-7, 73-13*; Chester Mts., *P. Siple & S. Corey 97A-1.*

PROTOBLASTENIA **alba** Dodge & Baker, sp. nov.

Pl. 52, figs. 239–245.

Type: Marie Byrd Land, Edsel Ford Range, Mt. Donald Woodward, *P. Siple, F. A. Wade, S. Corey & O. D. Stancliff DW-5.*

Thallus non assimilans male evolutus, paucis funiculis cellularum nigrarum; thallus assimilans crustosus, ad 1.85 mm. diametro aut areolatus in funiculis longis albus; cortex superior ad 10 μ crassitudine, fastigiatus, cellulis exteris obscuris, ad 5 μ diametro, cum strato cellularum emortuarum 4–5 μ crassitudine; algae protococcoideae, catervis parvis per totum thallum dispersis, densioribus sub apothecio; medulla ad 450 μ crassitudine, hyphis tenuibus, 1–2 μ diametro, laxe reticulatimque dispositis; cortex inferior non bene evolutus, paucis cellulis isodiametricis fuscis.

Apothecia ad 1.0 × 0.65 mm. metientes, irregulariter ellipsoidea maturitate, subspherica juventute, pulvinata, sessilia, immarginata, lecideina, nigra, non nitida; amphithecium non evolutum; parathecium 10–30 μ crassitudine, cortici simile sed cellulis minoribus, ad 2 μ diametro, hyalinum; hypothecium circa 10 μ crassitudine, hyphis periclinalibus tenuibus, hyalinum; thecium 40–50 μ altitudine; paraphyses 1 μ, capitibus 2 μ diametro, subobscuris; epithecium 5–10 μ crassitudine, KOH addito virescens; asci 35–44 × 10–13 μ, tenues, clavati, vaginati; ascosporae octonae, 7–9 × 3–3.5 μ, ellipsoideae, raro subreniformes, apicibus obtusis, hyalinae.

Non-assimilative portion poorly developed, consisting of a few strands of black cells; assimilative portion in small crustose patches up to 1.85 mm. in diameter, or areolate and spread out in long scant strands, pure white, the areolae sometimes outlined by scattered black non-assimilative tissues; upper cortex about 10 μ thick, fastigiate, the outer cells darkened but not very thick-walled, up to 5 μ in diameter, the outer surface covered by a layer of dead cells 4–5 μ thick; algae up to 9 μ in diam-

eter, protococcoid, scattered in small groups throughout the thallus and more or less massed below the apothecium; medulla up to 450 μ thick, of slender hyphae 1–2 μ in diameter, loosely reticulate; lower cortex not differentiated except for loose strands of fuscous isodiametric cells.

Apothecia measuring up to 1.0 × 0.65 mm., irregularly ellipsoidal at maturity, subspherical when young, pulvinate, sessile, never concave or marginate (sometimes a faint white margin can be seen in young stages), lecideine, black, not shining; amphithecium absent; parathecium 10–30 μ thick, cells differing from the cortex only in size, cells up to 2 μ, hyaline; hypothecium about 10 μ thick, of closely woven, slender hyphae, hyaline, tapering laterally then expanding above into the parathecium; thecium 40–50 μ tall; paraphyses 1 μ in diameter, somewhat greater above, expanding abruptly to a head 2 μ in diameter, slightly darkened on the outer surface, epithecium 5–10 μ thick, green with KOH; asci 35–44 × 10–13 μ, slender, clavate, with a prominent sheath, 8-spored; ascospores 7–9 × 3–3.5 μ, ellipsoidal, rarely subreniform, ends blunt, hyaline, unicellular.

On biotite-sericite and sericite-orthoclase schist.

MARIE BYRD LAND: Edsel Ford Range, Mt. Donald Woodward, *P. Siple, F. A. Wade, S. Corey & O. D. Stancliff DW-5*, type; Lichen Peak, *P. Siple & S. Corey 73-1.*

PROTOBLASTENIA **aurea** Dodge & Baker, sp. nov.

Pl. 52, figs. 230–238.

Type: Marie Byrd Land, Edsel Ford Range, Skua Gull Peak, *P. Siple & S. Corey 72W-13.*

Thallus assimilans ad 1.5 × 2.5 mm., granulosus vel crustosus, mollior madefactus, cremeus vel subalutaceus; cortex 10–20 μ crassitudine, amorphus, cellulis emortuis, raro paucis cellulis obscuris isodiametricis, sparsis aut stratum ad 30 μ crassitudine interius gignentibus; algae ad 17 μ diametro, protococcoideae, catervis densis per totum thallum sparsae vel in strato gonidiale 30–60 μ crassitudine; medulla ad 600 μ crassitudine, hyphis 1 μ diametro, dense basaliter laxius contexta; cortex inferior non evolutus aut paucis cellulis obscuris isodiametricis sparsis.

Apothecia ad 1.5 mm. diametro, irregulariter circularia, plana aut repanda, margine subcrenulata, aurantiaca thallo obscuriora, sparsa vel gregaria, sessilia; amphithecium non evolutum; parathecium 20–40 μ crassitudine, hyalinum, cellulis isodiametricis leptodermaticis, 2–3 μ diametro; hypothecium 20–30 μ, hyalinum, hyphis dense contextum; algae abundantes sub hypothecio; thecium 40–70 μ altitudine;

paraphyses 1 μ diametro, apicibus ramosis, septati, vaginati; epithecium ad 10 μ crassitudine, hyalinum, KOH–; asci 40–50 × 11–15 μ, clavati, vaginati, apicibus obtusis; ascosporae octonae, 9–12 × 2–4 μ, graciles, ellipsoideae vel subreniformes, apicibus obtusis, raro subacutis, hyalinae.

Spermogonia 60–80 μ altitudine, immersa; murus compactus, hyalinus, ostiola obscure brunnea, gelifacta; spermatia brevia, filiformia.

Assimilative thallus in areas up to 1.5 × 2.5 mm., granulose to crustose, softer when moistened, cream white to dull tan; cortex 10–20 μ, amorphous, of dead cells (decomposed *sensu* Hue), occasionally with a few isodiametric dark cells on the inside of the amorphous layer, scattered or forming a layer up to 30 μ thick; algae up to 17 μ in diameter in dense masses throughout the thallus or in a layer 30–60 μ thick below the cortex; medulla up to 600 μ thick, of slender hyphae 1 μ in diameter, closely woven with denser strands especially surrounding the larger groups of algae, basally becoming more open reticulate; basal cortex not differentiated or with a few scattered, dark, isodiametric cells.

Apothecia up to 1.5 mm. in diameter, irregularly circular, flat to repand, with a slightly crenulate margin, yellow-orange, darker than the thallus, scattered or gregarious, sessile; amphithecium absent; parathecium 20–40 μ thick, of hyaline isodiametric cells slightly larger next the surface, thin-walled, 2–3 μ in diameter; hypothecium 20–30 μ thick, hyaline, of densely woven slender hyphae and algae abundant below the hypothecium; thecium 40–70 μ tall; paraphyses about 1 μ in diameter, scarcely expanding upwards, tips simple, usually freely branched, septate with a thin sheath; epithecium about 10 μ thick, hyaline, KOH–; asci 40–50 × 11–15 μ, clavate, with a conspicuous sheath, ends blunt, 8-spored; ascospores 9–12 × 2–4 μ, slender, ellipsoidal to subreniform, ends blunt or rarely more pointed, hyaline.

Spermogonia 60–80 μ tall, immersed, ostiole slightly protruding; wall compact, hyaline except at the ostiole where it is dark brown and somewhat gelified; spermatia short-filiform.

On weathered coarse-grained pink granite, dark greenish gray slate, and the dark dyke of Mt. Grace McKinley.

KING EDWARD VII LAND: Rockefeller Mts., Mt. Helen Washington, *P. Siple, F. A. Wade, S. Corey & O. D. Stancliff HW-2, HW-3, HW-12, HW-13.*

MARIE BYRD LAND: Edsel Ford Range, Mt. Grace McKinley, *P. Siple, F. A. Wade, S. Corey & O. D. Stancliff McK-8*; Skua Gull Peak, *P. Siple & S. Corey 72W-13*, type, *72W-15, 72W-18*.

PROTOBLASTENIA **citrinigricans** Dodge & Baker, sp. nov.
Pl. 52, figs. 246–249.

Type: S. Victoria Land, Queen Maud Mts., Scudder Mt., *Q. A. Blackburn, R. S. Russell Jr. & S. D. L. Paine QM-2.*

Thallus assimilans 1–2 mm. diametro, rarus, delicatus, crustosus arachnoideusve, dilute flavus, inconspicuus; cortex non evolutus vel paucis cellulis isodiametricis aut cellulis fastigiatis sub apothecio; algae ad 12 μ diametro, protococcoideae, coloniis parvis sparsis, densioribus sub apothecio; medulla ad 350 μ crassitudine, hyphis 1–1.5 μ diametro; cortex inferior deest.

Apothecia ad 1.5 mm. diametro, subspherica, sparsa aut gregaria, dilute flavo-virentia aut obscure virentia nigricantiave; amphithecium deest; parathecium 60–85 μ subtus, hyphis tenuibus gelifactis flabellatim dispositis; hypothecium 10–20 μ, hyphis tenuibus dense compactum, hyalinum; thecium ad 35 μ altitudine; paraphyses 1 μ diametro, capitibus ad 2 μ, septati, vaginati, KOH virescentes, epithecium circa 5 μ crassitudine; asci 30–32 × 11–12 μ, breves, late clavati, vaginati; ascosporae octonae, 9–10 × 2.5–3 μ, ellipsoideae reniformesve, apicibus obtusis, hyalinae.

Assimilative thallus 1–2 mm., extremely scant, delicate, crustose to arachnoid, yellowish white, limited to the bases of apothecia and often penetrating cracks or small fissures in the rocks, very inconspicuous; cortex not developed except for a few isodiametric cells and a small region of fastigiate cells next the apothecium; algae up to 12 μ in diameter, protococcoid, scant, scattered through the thallus in small groups, slightly more massed beneath the apothecium; medulla up to 350 μ thick, of slender hyphae 1–1.5 μ in diameter, more closely woven about the algae; lower cortex lacking.

Apothecia up to 1.5 mm. in diameter, subspherical, scattered or more frequently closely gregarious, light yellow-green to dark green and black; no amphithecium; parathecium 60–85 μ thick below, of slender gelified septate hyphae spreading flabellately to 140 μ at the margin; hypothecium 10–20 μ thick, of densely woven hyphae continuous with the parathecium, penetrating the medulla between the colonies of algae, hyaline; thecium about 35 μ tall; paraphyses 1 μ in diameter, heads up to 2 μ, septate, with a thin sheath, greenish with KOH, epithecium about 5 μ thick; asci 30–32 × 11–12 μ, short, broadly clavate with

a prominent sheath, 8-spored; ascospores 9–10 × 2.5–3 μ, ellipsoidal to reniform, the ends blunt, hyaline.

On fine-grained gray granite and granitic sandy loam.

The extremes of color of the apothecia might be considered as corresponding to distinct species but many transitions are evident. In the light-colored apothecia, the ends of the paraphyses are not darkened and the epithecium is hyaline; in the dark-colored or black apothecia the ends of the paraphyses are dark and the epithecium is dark green to black.

S. VICTORIA LAND: Queen Maud Mts., Durham Point, northeast portal of Thorne Glacier, *Q. A. Blackburn, R. S. Russell Jr. & S. D. L. Paine QM-3, QM-4*; Scudder Mt., 86°03′ S., 150°40′ W., *Q. A. Blackburn, R. S. Russell Jr. & S. D. L. Paine QM-2*, type, *QM-6(1), QM-6(4)*.

BLASTENIA

BLASTENIA Massalongo, Atti I. R. Ist. Venet. II. **3**: append. 101. 1852; Flora **35**: 575. 1852.

The type species of *Blastenia* was not designated. Of the six species treated, four are now placed in *Caloplaca*, so the choice is narrowed to *B. sinapisperma* (Lamarck) Mass. and *B. Visianica* Mass. Since the latter species may be considered as the type of *Kuttlingeria*, we choose *B. sinapisperma* (Lamarck) Mass.

Thallus crustose, uniform, continuous, powdery, granulose or rimrose, attached to the substrate by the hyphae of the prothallus or of the medulla, homoeomerous or heteromerous; ecorticate; algae *Protococcus*. Apothecia round, immersed or sessile, light or dark; parathecium well developed, very rarely including a few algal cells; epithecium granular or powdery, becoming violet or purple with KOH; hypothecium hyaline; paraphyses simple, septate, capitate; asci 4–16-spored; ascospores hyaline, ellipsoid to elongate, polaribilocular. Spermogonia immersed, spherical, spermatia short, cylindric, straight, rarely acicular or curved.

KEY TO ANTARCTIC SPECIES

Thallus continuous, amber yellow; ascospores 13–16 × 6.5–8(–9) μ....... *B. succinea*

Thallus granulose to verrucose.

Thallus white; apothecia convex, margin evanescent; ascospores 12–22 × 6–11 μ.. *B. leucoraea*

Thallus deep olive buff, gray, or black; apothecia concave, margin persistent; ascospores 11–15 × 6–8 μ .... *B. grisea*

BLASTENIA **succinea** Dodge & Baker, sp. nov.

Pl. 53, figs. 250–254.

Type: Marie Byrd Land, Edsel Ford Range, Lichen Peak, *P. Siple & S. Corey 73-7.*

Thallus crustosus, mollis vel subgelifactus madefactus, irregularis, continuus, albidus vel succineo-flavus, vel marginibus subbrunneis; cortex 10–20 μ crassitudine, fastigiatus, non continuus, paucis cellulis exteris obscurioribus; algae protococcoideae, solo in strato coloniarum sparsarum sub hypothecio visae; medulla 100–200 μ crassitudine, hyphis tenuibus reticulatim dispositis; stratum basale non evolutum sed totus thallus super speciem *Rivulariae* innascens et ejus hyphae partem superiorem vaginae penetrantes.

Apothecia ad 1 mm. saepe circa 0.5 mm. diametro, irregularia, concava juventute, applanata vel repanda maturitate, brunnea vel nigra, purpureo-rubescens KOH addito; amphithecium non evolutum sed stratum gonidiale sub hypothecio adest; parathecium paucis cellulis in cortice mergens; hypothecium 10–20 μ crassitudine, hyalinum, hyphis tenuibus compactis; thecium 40–60 μ altitudine; paraphyses 1–1.5 μ diametro, apicibus vaginatis, ad 6 μ diametro, obscurascentibus, ad apices ramosi vel non ramosi, septati, vaginati, epithecium 5–10 μ crassitudine, obscurum sed non carbonaceum, densum, gelifactum; asci 40–48 × 17–22 μ, elongato-clavati juventute, late clavati maturitate; ascosporae octonae, 13–16 × 6.5–8(–9) μ, polariloculares cellulis separatis, quaque uninucleata, hyalinae, ellipsoideae, apicibus obtusis vel subacutis.

Thallus a few mm. in diameter at its best development, crustose, soft to somewhat gelified when moist, irregular, continuous, not conspicuously areolate, whitish to amber yellow, sometimes brownish at the margins; upper cortex 10–20 μ, not continuous, fastigiate, a few outer cells somewhat darkened; algae *Protococcus* seen only in a layer of scattered colonies beneath the hypothecium; medulla 100–200 μ thick, of slender reticulate hyphae, basal layer not differentiated, the whole usually growing over a gelified mass of *Rivularia* sp. with a few medullar hyphae penetrating the upper portions of the gel but apparently not being stimulated by the alga to form cephalodia.

Apothecia up to 1 mm. in diameter, usually smaller, about 0.5 mm., irregular, circular, concave when young becoming flattened or even convex at maturity, without an amphithecium, brown to black, turning purple-red with KOH; parathecium of a few cells merging with the cortex; hypothecium 10–20 μ, not

thinning toward the margin, of slender, compactly reticulate hyphae; thecium 40–60 μ high; paraphyses 1–1.5 μ, expanding slightly to enlarged apices which are surrounded by a gel which reaches a diameter of 6 μ, usually darkened on the outer surfaces, branched near the tip or unbranched, septate, sheathed, epithecium 5–10 μ thick, dark but not carbonaceous, gelified, dense; asci 40–48 × 17–22 μ, 8-spored, elongate-clavate when young but short and broadly clavate at maturity; ascospores 13-16 × 6.5–8(–9) μ, polaribilocular, the cells distinctly separated, each uninucleate, hyaline, ellipsoidal, the ends blunt to somewhat pointed.

Growing over mosses, *Umbilicaria cerebriformis,* sandy loam from granite, and dark greenish gray slate.

The thallus seems much reduced in this species. Apparently an areole functions as an assimilative unit for a certain time, then the biatorine apothecium develops just above the algal layer, covering the whole areole. Perhaps it is approaching heterotrophism by securing much of its nourishment from the *Rivularia* species with a corresponding reduction of thallus as is often found with increasing parasitism.

MARIE BYRD LAND: Edsel Ford Range, Mt. Rea-Cooper, *P. Siple, F. A. Wade, S. Corey & O. D. Stancliff R-2;* Skua Gull Peak, *P. Siple & S. Corey 72W-5, 72W-14;* Lichen Peak, *P. Siple & S. Corey 73-4, 73-7,* type.

BLASTENIA **grisea** Dodge & Baker, sp. nov.

Pl. 53, figs. 255–260.

Type: Marie Byrd Land, Edsel Ford Range, Lichen Peak, *P. Siple & S. Corey 73-6.*

Thallus non assimilans ad 1 mm. longitudine, funiculis nigris, fimbriatis; thallus assimilans 20 × 8 mm., granulosus, lobatus, subfruticosus, delicatus, pallide flavus, olivaceo-alutaceus, griseus nigricansve; cortex male evolutus, cellulis fuscis isodiametricis in lateribus areolarum sparsis, fastigiatis; algae ad 10 μ, protococcoideae, sparsae, paucae; medulla 150–200 μ crassitudine, cellularis (sensu Nylander) ad apothecium, hyphis reticulatim dispositis; cortex inferior nullus.

Apothecia ad 0.65 mm. diametro, circularia, concava, marginata, raro subimmersa, aurantio-brunnea, rubro-brunnea vel nigra, KOH rubescens; amphithecium deest; parathecium 10–20 μ crassitudine, paucis cellulis eis epitheciorum similibus; hypothecium 30–40 μ crassitudine, hyalinum, hyphis tenuibus; thecium 40–50 μ altitudine; paraphyses 0.5–1.0 μ, apicibus 1.5 μ diametro, subflexuosi, septati, raro ramosi, epithecium 10–20 μ, hyalinum; asci 34–45 × 10–15 μ, breves, clavati, obtusi;

ascosporae octonae, 11–15 × 6–8 μ, polaribiloculares deinde uniseptatae, hyalinae, cellulis uninucleatis.

Non-assimilative thallus of black fimbriate strands up to 1 mm. long; assimilative portion 20 × 8 mm., granular to lobed, and almost dwarf-fruticose, very delicate, yellowish white to deep olive buff or gray and black; cortex not well developed except for a few lateral regions where scattered fuscous isodiametric cells are found with fastigiate dark cells over the algal layer; algae up to 10 μ, protococcoid, scattered in the thallus or occasionally near the surface, scant; medulla 150–200 μ thick, cellular *(sensu* Nylander) near the apothecium, but mostly of reticulately woven hyphae; lower cortex not differentiated.

Apothecia up to 0.65 mm. in diameter, small, more or less circular, concave with a small margin, sometimes almost immersed in the thallus, dull orange to red-brown and black, red with KOH; parathecium 10–20 μ thick, of a few cells scarcely differing from those of the adjacent epithecium; hypothecium 30–40 μ thick, hyaline, tapering slightly from the center, filamentous; thecium 40–50 μ tall; paraphyses 0.5–1.0 μ in diameter, reaching 1.5 μ at the tips, somewhat flexuous, septate, occasionally branched, scarcely expanded above and not darkened, epithecium 10–20 μ, light; asci 34–45 × 10–15 μ, short-clavate, blunt at both ends at maturity, 8-spored; ascospores 11–15 × 6–8 μ, polaribilocular at first, becoming septate, hyaline, each cell uninucleate.

On arkosic sandstone.

Marie Byrd Land: Edsel Ford Range, Lichen Peak, *P. Siple & S. Corey 73-4, 73-6,* type.

KUTTLINGERIA

Kuttlingeria Trevisan, Riv. Period. Lav. Accad. Padova 5: 72. 1857.

The type species is *K. Visianii* Trevisan *(Blastenia Visianica* Mass.). The other species originally included by Trevisan agree less well with the generic description and are considered as belonging in *Blastenia* Mass., from which this genus was segregated.

Thallus crustose, central portion granulose, areolate, margin effigurate, lobate to subfoliose, corticate; algae protococcoid;

medulla filamentous, basal cortex present. Apothecia biatorine, adnate; parathecium well developed; hypothecium hyaline; paraphyses branched or simple, capitate; asci clavate, 8-spored; ascospores polaribilocular at first, becoming uniseptate.

KUTTLINGERIA **rufa** Dodge & Baker, sp. nov.

Pl. 53, figs. 261–266; pl. 65, fig. 425.

Type: Marie Byrd Land, Edsel Ford Range, Mt. Donald Woodward, *P. Siple, F. A. Wade, S. Corey & O. D. Stancliff* *DW-4.*

Thallus in area 1.5 cm. diametro radians, lobulis ad 1.1 mm. latitudine, irregulariter ramosis, marginibus impendentibus vel applanatis, in saxis appressus, rufus Martis vel salmoneo-aurantius albusve, KOH addito obscure rubescens; cortex 20–30 μ crassitudine, centro saepe abest, pseudoparenchymaticus, cellulis leptodermaticis; stratum gonidiale 55–60 μ crassitudine, coloniis paucis parvisque late dispositis; medulla ad 500 μ crassitudine, hyphis 3.5–4 μ diametro, laxe reticulatimque dispositis anastomosantibusque, in areis decorticatis compactioribus; cortex inferior similis cortici superiori.

Apothecia ad 0.3 mm. diametro, sparsa, sessilia, concoloria, convexa; amphithecium deest; parathecium male evolutum, paucis cellulis in cortice marginali mergens, cortex marginalis ad 15 μ crassitudine; hypothecium 30–40 μ, hyalinum, hyphis tenuibus compacte reticulatis; thecium 50–60 μ altitudine; paraphyses 1 μ diametro, apicibus 2–2.5 μ, cellula penultima maiore quam cellula ultima, ad 3.5 μ diametro, raro ad apicem ramosi, non vaginati, insuper septati, basaliter cellulis longioribus vel non septati, epithecium gelifactum, 5–10 μ crassitudine, brunneum; asci 44–55 × 11–14 μ, elongato-clavati juventute, latiores maturitate, apicibus vaginatis; ascosporae 12–15 × 5–7 μ, octonae, polaribiloculares, quaque cellula uninucleata, tenuiter ellipsoideae, apicibus subacutis.

Thallus radiate over an area 1.5 cm. in diameter, of irregularly branched lobes up to 1.1 mm. across, the margins overhanging, flattened, closely attached to the substratum, Mars red to salmon orange, white over decorticate portions in the center of the thallus, dark red with KOH; upper cortex 20–30 μ thick where best developed, pseudoparenchymatous, an even layer of thin-walled cells; algal layer 55–60 μ thick, of a few small colonies scattered through the layer; medulla up to 500 μ thick, of rather coarse hyphae 3.5–4 μ in diameter loosely reticulate and anastomosed, in the decorticate areas extending to the surface where it is thicker and more closely reticulate but never stratified, slightly more compact in areas adjacent to the cortex; lower cortex similar to the upper cortex.

Apothecia up to 0.3 mm. in diameter, scattered, sessile, usually well back from the extremities of the lobes, concolorous with the thallus, convex, strongly so when young, but without an amphithecium; parathecium thinning above, an upward continuation of the hypothecium merging with the cortex which reaches about 15 μ thick; hypothecium 30–40 μ thick, hyaline, of slender closely reticulated hyphae; thecium 50–60 μ tall; paraphyses 2–2.5 μ at the tip, tapering to 1 μ in diameter below, the penultimate cell often exceeding the apical cell, up to 3.5 μ in diameter, occasionally branched near the tips, without sheaths, septate above, of longer cells or undivided below, epithecium 5–10 μ, gelified, golden brown to darker brown; asci 44–55 × 11–14 μ, 8-spored, elongate-clavate when young, broadly so at maturity, sheath apically prominent; ascospores 12–15 × 5–7 μ, polaribilocular, each cell uninucleate, slender-ellipsoidal with somewhat pointed ends.

On biotite sericite.

MARIE BYRD LAND: Edsel Ford Range, Mt. Donald Woodward, *P. Siple, F. A. Wade, S. Corey & O. D. Stancliff DW-4*, type.

KUTTLINGERIA **rutilans** Dodge & Baker, sp. nov.

Pl. 53, fig. 267; pl. 54, figs. 268–270.

Type: Marie Byrd Land, Edsel Ford Range, Skua Gull Peak, *P. Siple & S. Corey 72W-9.*

Thallus ad 15 mm. diametro, foliosus vel subfruticosus, lobatus, lobis elongatis, angustis, contortis, irregulariter dichotome ramosis, rutilans; cortex 8–12 μ crassitudine, cellulis isodiametricis; algae protococcoideae, ad 10 μ diametro, sub cortice sparsae, paucae, sub apothecio gregariae; medulla laxissime contexta, hyphis tenuibus; cortex inferior bene evolutus, cum superiore congruens.

Apothecia ad 0.5 mm. diametro, sine margine conspicua, rufus; amphithecium deest; parathecium 40–50 μ crassitudine, hyalinum, hyphis septatis, 3–4 μ, dense implexis, sub hypothecio continuum; hypothecium 10–12 μ crassitudine, hyalinum, hyphis irregulariter implexis; thecium 50–65 μ altitudine; paraphyses 0.5 μ diametro, capitibus majoribus, vaginatis, ad 3.5 μ diametro, simplices vel ramosi, septati, hyalini, epithecium 5–10 μ crassitudine, flavum, crystallis numerosissimis; asci 55–64 × 14.5–15 μ, elongati, clavati, obtusi, vaginati; ascosporae octonae, 12.5–13.5 × 7–8 μ, polaribiloculares, uninucleatae, hyalinae.

Non-assimilative portion lacking; assimilative thallus up to 15 mm. in diameter, foliose to subfruticose, lobes long, narrow, contorted, irregularly dichotomously branched, grena-

dine red to English red; cortex 8–12 μ thick, a dense layer of isodiametric cells, only the outermost darkened; algae protococcoid, up to 10 μ in diameter, scattered near the upper cortex, few, more closely packed below the apothecium; medulla very loosely woven, of slender hyphae; lower cortex identical with the upper.

Apothecia up to 0.5 mm. in diameter, flattened, without a conspicuous margin, grenadine red to English red; amphithecium absent; parathecium 40–50 μ thick, hyaline, of closely woven septate hyphae 3–4 μ in diameter continued below the hypothecium which is 10–12 μ thick, hyaline, of closely and irregularly woven cells, not tapering outward; thecium 50–65 μ tall; paraphyses 0.5 μ in diameter, gradually expanding to larger cells near the tips, heads with conspicuous sheaths up to 3.5 μ in diameter, branched or simple, hyaline throughout, epithecium 5–10 μ thick, yellow, composed of numerous crystals; asci 55–64 × 14.5–15 μ, elongate, clavate, rather blunt, with a conspicuous sheath, 8-spored; ascospores 12.5–13.5 × 7–8 μ, polaribilocular, cells uninucleate, hyaline.

Loose on moss clumps and sandy loam.

MARIE BYRD LAND: Edsel Ford Range, Skua Gull Peak, *P. Siple & S. Corey 72W-9*, type.

HUEA

Huea Dodge & Baker, gen. nov.

The type species is *Huea flava* Dodge & Baker.

Thallus crustosus, rugosus, granulosusve, ecorticatus corticatusve; algae protococcoideae; cortex inferior non evolutus. Apothecia sessilia, circularia, nigra; parathecium nigrum, carbonaceum, pseudoparenchymaticum, sub hypothecio continuum; hypothecium fuscum, hyphis tenuibus dense compactum; epithecium nigrum; ascosporae octonae, ellipsoideae, hyalinae, polaribiloculares. Spermogonia immersa, ostiolis nigris, spermatiophorae ramosae, articulatae; spermatia cylindrica, brevia, recta.

Thallus crustose, uniform, rugose, granulose, attached to the substrate by the medullar hyphae, heteromerous, ecorticate or corticate; algae protococcoid; basal cortex not differentiated. Apothecia sessile, circular, black; parathecium black, carbonaceous, pseudoparenchymatous, continued in a thick layer below the hypothecium which is dark; epithecium

black, asci 8-spored; ascospores ellipsoid, hyaline, polaribilocular. Spermogonia immersed, with a black ostiole, spermatiophores branched and closely septate; spermatia cylindric, short, straight.

So far as known, this genus is confined to the Antarctic. **Huea cerussata** (Hue) Dodge & Baker, comb. nov. *(Lecidea (Blastenia) cerussata* Hue, Deuxième Exp. Antarct. Franç. Lichens, 101. 1915) and **Huea coralligera** (Hue) Dodge & Baker, comb. nov. *(Lecidea (Blastenia) coralligera* Hue, Deuxième Exp. Antarct. Franç. Lichens, 102. 1915) have been described from the Graham Land Archipelago. Hue first pointed out these species as differing from all other species in his section *Blastenia* in the structure of the parathecium; hence it gives us pleasure to dedicate this genus to him.

KEY TO ANTARCTIC SPECIES

Thallus ecorticate, yellow, granulose .... *H. flava*
Thallus corticate.
  Thallus whitish, surface rugose to granulose, verrucose; cortex 10–40 μ, without layer of dead cells .... *H. cerussata*
  Thallus ashy to black, surface coralloid; cortex 20 μ, with layer of dead cells .... *H. coralligera*

HUEA **flava** Dodge & Baker, sp. nov.

Pl. 54, figs. 271–275.

Type: Marie Byrd Land, Edsel Ford Range, Lichen Peak, *P. Siple & S. Corey 73-10.*

Thallus assimilans ad 1.5 mm., granulosus, mollis madefactus, flavus; ecorticatus; algae ad 18 μ diametro, protococcoideae, per thallum sparsae, paucae; medulla circa 200 μ diametro, hyphis 2–3 μ diametro, pachydermaticis, reticulatim dispositis, densioribus ad algas et in basi; cortex inferior deest.

Apothecia ad 0.25 mm. diametro, irregulariter circularia, marginata, nigra, carbonacea; amphithecium deest; parathecium 20–30 μ crassitudine, cellulis nigris pachydermaticis, carbonaceum, sub hypothecio continuum; hypothecium 10–15 μ crassitudine, brunneum fuscumve, hyphis dense compactis; thecium 30–40 μ altitudine; paraphyses 1–1.5 μ, apicibus vaginatis, ad 4 μ diametro, obscure griseoviridibus, septati, simplices, raro ramosi, epithecium 5–10 μ, obscurum; asci 27–36 × 10–14 μ, clavati, vaginati; ascosporae octonae, 8–9 × 4–4.5 μ, polaribiloculares, ellipsoideae, hyalinae, cellulis uninucleatis.

Non-assimilative portion of thallus lacking; assimilative thallus up to 1.5 mm. in diameter, scant, granulose, soft when

moistened, yellow; ecorticate; algae up to 18 μ in diameter, protococcoid, few, scattered in the thallus; medulla about 200 μ thick, of thick-walled hyphae 2–3 μ in diameter, loosely reticulate, closer near the algae and near the base; lower cortex lacking.

Apothecia up to 0.25 mm. in diameter, irregularly circular, marginate, black, carbonaceous; amphithecium not developed; parathecium 20–30 μ thick, of thick-walled black cells, so dark their individuality is obscured, continuous under the hypothecium, tapering slightly at the margin; hypothecium 10–15 μ thick, brown to fuscous, of densely interwoven hyphae; thecium about 30–40 μ tall; paraphyses 1–1.5 μ in diameter, apical cells surrounded by large gelified sheaths up to 4 μ in diameter, dark greenish gray, septate, simple or rarely branched; epithecium 5–10 μ, dark; asci 27–36 × 10–14 μ, clavate, with a small sheath, 8-spored; ascospores 8–9 × 4–4.5 μ, polaribilocular, the cells separate, each uninucleate, hyaline, ellipsoidal.

On weathered coarse-grained pinkish gray granite, fine-grained dike, and sericite-orthoclase schist.

MARIE BYRD LAND: Edsel Ford Range, Mt. Rea-Cooper, *P. Siple, F. A. Wade, S. Corey & O. D. Stancliff R-7*; Lichen Peak, *P. Siple & S. Corey 73-7, 73-10*, type; Mt. Stancliff, *P. Siple & S. Corey 72A-1.*

PYRENODESMIA

PYRENODESMIA Massalongo, Atti I.R. Ist. Veneto, II. **3**: 119. 1853.

Callopisma DeNotaris, Giorn. Bot. Ital. II. **2**: 198. 1847, non *Callopisma* Martius, Nov. Gen. Sp. Pl. **2**: 107. *pl. 183, 184.* 1827 (Gentianaceae).

Caloplaca Th. Fries, Lich. Arctoi, 218. 1860.

The type of *Pyrenodesmia* is not designated. *P. Agardhiana* (Fw.) Mass., *P. chalybaea* (Fr.) Mass., *P. olivacea* Mass., and *P. variabilis* (Pers.) Mass. were treated, all in *Caloplaca* sect. *Eucaloplaca* as understood by recent authors. The type of *Callopisma* may be chosen as *C. cerina* (Ehrh.) DNtrs., since *C. murorum* (Hoffm.) DNtrs. and *C. vulgaris* DNtrs. were transferred to *Gasparrinia* by Tornabène in 1849 and by DeNotaris to *Aglaopisma* in Baglietto in 1856. The

type of *Caloplaca* was not designated. Seven species were listed, of which *C. cerina* (Ehrh.) Th. Fr. may be taken as the type, since Th. Fries merely intended *Caloplaca* to replace *Callopisma* which had previously been used by Martius.

Thallus crustose, attached to the substrate by the hyphae of the prothallus or of the medulla, without rhizinae, uniform, mostly yellow and becoming purple with KOH, heteromerous; ecorticate or nearly so; algae *Protococcus;* medulla arachnoid, of thin-walled hyphae. Apothecia round, appressed or sessile, seldom immersed, lecanorine with well-developed amphithecium containing cortex, algal layer, and medulla; epithecium granulose to powdery, usually becoming purple or violet with KOH; hypothecium hyaline, lying above the algal layer; paraphyses simple, septate, capitate; asci 8-spored; ascospores hyaline, ellipsoidal to rhomboidal, usually polaribilocular, often the cells appearing connected by an isthmus. Spermogonia immersed, with a hyaline wall, spermatiophores close-septate; spermatia short, straight, elongate to cylindrical.

KEY TO ANTARCTIC SPECIES

Growing over mosses.
  Thallus not developed; ascospores 10–12 × 7–9 μ.................*P. athallina*
  Thallus well developed, ecorticate; sterile.......................*P. Darbishirei*
Saxicolous.
  Cortex of vertical hyphae, upper half fastigiate; thecium 90–100 μ; ascospores 12–16 × 7–8 μ.....................................*P. cinericola*
  Cortex of intricate hyphae.
    Cortex 20–30 μ; thecium 80–100 μ; ascospores 12–16 × 5–7 μ......*P. citrina*
    Cortex 30–70 μ; thecium 70–80 μ; ascospores 12–24 × 6–14 μ....*P. aurantiaca*

PYRENODESMIA **Darbishirei** Dodge & Baker, sp. nov.
Pl. 62, figs. 401–403; pl. 63, fig. 411.

Physcia cirrhochroa Darbishire, Nat. Antarct. [Discovery] Exp. Nat. Hist. **5**: Lichenes, 9. 1910, non Ach.

Type: Marie Byrd Land, Edsel Ford Range, Skua Gull Peak, *P. Siple & S. Corey 72W-14.*

Pars non assimilans inconspicua, male evoluta, funiculis obscuris hypharum, cellulis irregularibus, interne amorpha; pars assimilans ad 2 mm. diametro, 0.50 mm. altitudine, in solo inter muscos, flava vel ochraceo-aurantiaca, inferne albida, KOH rubro-aurantiaca, irregularia, flabellata, marginibus crenulatis; cortex non evolutus, superficie amorpha, 2–8 μ crassitudine; algae protococcoideae, coloniis

subsphericis per totam areolam basi excepto dispositis; medulla cellulis irregularibus leptodermaticis, inferne reticulata, cellulis pachydermaticis subbrunneis; stratum basale non evolutum sed cellulis imis medullaribus pachydermaticis obscurisque.

Non-assimilative portions inconspicuous, not well developed, of dark hyphal strands of irregular cells without definite organization, internally amorphous; assimilative portions up to 2 mm. in diameter and 0.50 mm. high, growing on soil among mosses, often conspicuous over areas of 2–3 cm., primuline yellow to ochraceous orange becoming almost white at the bottom, changing to bright orange-red on the addition of KOH, irregular, flabellate, edges crenulate; upper cortex not differentiated, the outer surface amorphous to a depth of 2–8 μ; algae scattered throughout the areolae except the base, protococcoid, in subspherical colonies; medulla of irregular thin-walled cells near the base, becoming more open and reticulate, the cells with thicker walls, slightly brownish; lower cortex not morphologically differentiated, the lowest row of cells often having the outermost surfaces thickened and dark. Sterile.

Apparently growing over mosses and an old lichen thallus with ellipsoidal colonies of *Nostoc* which has been parasitized by a common brown hyphomycete.

While we have not seen Darbishire's material this seems to be the same imperfect lichen referred by him to *Physcia cirrhochroa* Ach. From the structure of the thallus it seems much more closely related to *Pyrenodesmia*. Darbishire suggested a possible relationship to *Placodium*, i. e. *Gasparrinia*, but its ecorticate condition excludes it from that genus.

MARIE BYRD LAND: Edsel Ford Range, Skua Gull Peak, *P. Siple & S. Corey 72W-2, 72W-7, 72W-14*, type; Lichen Peak, *P. Siple & S. Corey 73-3, 73-4, 73-7*; Mt. Donald Woodward, *P. Siple, F. A. Wade, S. Corey & O. D. Stancliff DW-1*.

PYRENODESMIA **athallina** (Darbishire) Dodge & Baker, comb. nov.

Caloplaca athallina Darbishire, Wiss. Ergebn. Schwed. Südpolar-Exp. 1901-1903. . . Nordenskjöld 4^{11}: 9. *pl. 2. f. 14.* 1912.

Type: Graham Land, Paulet Island, *Skottsberg*.

Pyrenodesmia **aurantiaca** (Lightfoot) Dodge & Baker, comb. nov.

Lichen aurantiacus Lightfoot, Fl. Scotica **2**: 810. 1777.

Caloplaca aurantiaca Th. Fries, Nova Acta R. Soc. Sci. Upsal. III. **3**: 219. 1861.

Type: Scotland, *Lightfoot.*

Reported from the Graham Land Archipelago.

Pyrenodesmia **cinericola** (Hue) Dodge & Baker, comb. nov.

Lecanora (Caloplaca) cinericola Hue, Deuxième Exp. Antarct. Franç. Lich. 72–73. 1915.

Caloplaca cinericola Darbishire, Brit. Antarct. [Terra Nova] Exp. 1910, Bot. **3**: 54. 1923.

Type: Graham Land Archipelago, Deception Island, near Pendulum Cove, *Gain.* This species has a much better developed cortex than is usual in this genus and is referred here on account of its uniform areolate thallus.

GASPARRINIA

Gasparrinia Tornabène, Lichenogr. Sicula, 27. 1849.

Amphiloma Koerber, Syst. Lich. Germ. 110. 1855, non *Parmelia* sect. *Amphiloma* Fries, Lichenog. Eur. Reform. 87. 1831.

Aglaopisma DeNotaris ap. Baglietto, Mem. Accad. Sci. Torino, II. **17**: 396. 1856.

No type species was designated. Eight species were listed, of which three belong elsewhere. Of the five remaining, two belong in *Pyrenodesmia,* leaving three in the group as subsequently understood. Th. M. Fries retained this group as a subgenus of *Caloplaca* for *C. callopisma* (Ach.) Th. Fr. *(Callopisma vulgaris* DeNotaris), *C. murorum* (Hoffm.) Th. Fr., and added *C. elegans* (Link) Th. Fr. and *C. cirrochroa* (Ach.) Th. Fr. Since Tornabène regarded *C. callopisma* as a variety of *G. murorum* (Hoffm.) Torn., we may choose the latter as the type. Koerber, in proposing *Amphiloma,* discusses *A. elegans* (Link) Koerb. and *A. murorum* (Hoffm.) Koerb. in detail and five other species briefly. If *A. murorum* is taken as the type, the name is an exact synonym of *Gasparrinia;* if *A. elegans* (Link) Koerb. be chosen it must be shown that it

is not congeneric with *Gasparrinia murorum*. *Aglaopisma* was based on *A. murorum* (Hoffm.) DNtrs. and *A. vulgaris* DNtrs. (*Gasparrinia murorum* v. *callopisma* Tornabène). Therefore this also is an exact synonym of *Gasparrinia*.

Thallus crustose, attached to the substrate directly, or by rhizinae, effigurate or lobed and subfoliose at the margin, mostly yellow and becoming purple with KOH, heteromerous; corticate on both surfaces, cortex pseudoparenchymatous, cells thin-walled; algae *Protococcus*; medulla arachnoid, of thin-walled hyphae. Apothecia round, appressed or sessile, lecanorine; amphithecium containing cortex, algae, and medulla; epithecium granulose or powdery, usually becoming purple or violet with KOH; hypothecium hyaline, lying above the algal layer; paraphyses simple, septate, capitate; asci 8-spored; ascospores hyaline, ellipsoidal, polaribilocular, cells often connected by an isthmus. Spermogonia immersed with a hyaline wall, spermatiophores close-septate; spermatia short, straight, cylindric.

KEY TO ANTARCTIC SPECIES

Margin laciniate but more or less indeterminate.
- Apothecia up to 1.5 mm.; laciniae white, ciliate; medullar hyphae vertical; thecium 110–120 μ .... *G. Joannae*
- Apothecia about 0.6 mm.
  - Thallus areolate, laciniate; medullar hyphae vertical; thecium 100 μ .... *G. sublobulata*
  - Thallus reticulate, laciniate; medullar hyphae horizontal; thecium 70–80 μ .... *G. inordinata*

Margin thick.
- Laciniae 0.2–0.3 mm. broad, with sorediose tips; spores 11–18 × 5–6 μ; thecium 80–90 μ .... *G. cirrochrooides*
- Laciniae not sorediose.
  - Laciniae torulose, unequal, often shining; spores 11 × 5 μ .... *G. lucens*
  - Laciniae cylindric, center granular; spores 14–18 × 7–9 μ; cortex thick and differentiated into two layers .... *G. Gainii*
  - Laciniae flattened, center areolate; spores 11–16 × 6–9 μ .... *G. elegans*
  - Laciniae flattened, center subareolate, verrucose; spores 11–16 × 4–7 μ; lower cortex often almost absent.
    - Thallus yellow-orange, 0.3–0.5 μ thick, pruinose .... *G. murorum*
    - Thallus red-orange and browning, thinner, not pruinose .... v. *miniata*
  - Laciniae flattened, center continuous; spores 12.5–16 × 5–8 μ; lower cortex well developed with rhizoidal strands adhering to the rock, cadmium orange to orange-chrome, not pruinose .... *G. Siplei*

Gasparrinia **Siplei** Dodge & Baker, sp. nov.

Pl. 54, figs. 287–289; pl. 55, figs. 290–296; pl. 65, figs. 429, 431.

Type: Marie Byrd Land, Edsel Ford Range, Skua Gull Peak, *P. Siple & S. Corey 72W-6*.

Thallus ad 20 mm. diametro, subfoliosus, centro continuo, marginibus lobatis, lobis planis, subelevatis, ad 1 mm. latitudine, dichotome vel varie ramosis, apicibus frequenter subdigitatis, lobis minoribus subtorulosis, aurantiacus, KOH addito rufescens; cortex superior 20–40 μ crassitudine, cellulis leptodermaticis isodiametricis, 2–4 μ diametro, laxe contextus, strato 2–5 μ crassitudine, cellularum emortuarum tectus; algae protococcoideae, ad 15 μ diametro, in medulla sparsae et stratum irregulare sub cortice formantes; medulla 180–500 μ crassitudine, hyphis leptodermaticis, 1.5–3 μ diametro, ramosis, irregulariter contexta, densius circum algas; cortex inferior 12–30 μ crassitudine, cellulis isodiametricis leptodermaticis, exteris obscuris; rhizinae cellulis 2–3 μ diametro, fastigiatis, exteris obscuris.

Apothecia ad 1.5 mm. diametro, juventute marginibus inflexis, subconcava vel plana maturitate, aurantiaca, singula vel caespitosa, sessilia; amphithecium 100–150 μ crassitudine, cortice fastigiato, algis multis, sub hypothecio, non in amphithecio penetrantibus, medulla ut in thallo; parathecium 20–30 μ crassitudine, hyalinum, insuper hyphis fastigiatis; hypothecium 30–50 μ crassitudine, hyphis dense compactis, hyalinum ad margines tenuescens; thecium 70–80 μ altitudine; paraphyses 0.75–1.0 μ subtus, cellulis longis, insuper incrassati, cellulis brevibus capitibus ad 3.5 μ diametro, subsphericis, crustati, KOH addito subvirescens, epithecium 10–12 μ crassitudine; asci 60–75 × 11.5–17 μ, elongati et late clavati; ascosporae octonae, 12.5–16 × 5–8 μ, biloculares, cellulis uninucleatis, ellipsoideae, apicibus obtusis vel acutis, hyalinae.

Thallus up to 20 mm. in diameter, subfoliose, center continuous, margin lobed and somewhat elevated; lobes flattened or subcanaliculate, up to 1 mm. wide, dichotomously or variously branched, tips often somewhat digitate, the smaller lobes sometimes little branched and somewhat torulose, cadmium orange to orange chrome, turning bright red with KOH; upper cortex 20–40 μ thick, of thin-walled isodiametric cells 2–4 μ in diameter, somewhat loosely packed, covered by an outer layer 2–5 μ thick of dead cells; algae protococcoid, up to 15 μ in diameter, abundant, scattered in the medulla and forming an irregular layer beneath the cortex; medulla 180–500 μ thick, of thin-walled hyphae 1.5–3 μ in diameter, branching and anastomosing to form an open network, sometimes more closely packed about the algae; lower cortex 12–30 μ thick, of thin-walled, isodiametric cells 2–4 μ in diameter, outer cells darkened, without dead cells; rhizinae common, cells 2-

3 μ in diameter, densely packed in a palisade, darkened on the outer surfaces.

Apothecia up to 1.5 mm. in diameter, margins strongly in-rolled when young, only slightly concave or plane at maturity, cadmium orange to orange chrome, single or densely crowded in the center of the thallus, sessile; amphithecium 100–150 μ thick, cortex fastigiate with a gradual transition below to that of the thallus; algae abundant, in a dense layer 40–70 μ thick below the hypothecium, not penetrating the amphithecium, medulla similar to that of the thallus; parathecium 20–30 μ thick, hyaline, fastigiate above; hypothecium 30–50 μ thick, of densely woven hyphae similar to those of the medulla, hyaline, tapering gradually outward; thecium 70–80 μ tall; paraphyses 0.75–1.0 μ in diameter below, cells very long, septa rare, tapering gradually toward the tips with more frequent septa, heads of 3–5 shorter cells, up to 3.5 μ in diameter, the ultimate cells subspherical, covered by a thick rough incrustation, slightly greenish with KOH, branched or simple with a thin sheath above which disappears below, epithecium 10–12 μ thick; asci 8-spored, 60–75 × 11.5–17 μ, elongate and broadly clavate; ascospores 12.5–16 × 5–8 μ, 2-celled, each cell separate with its own nucleus, ellipsoidal with blunt or pointed ends, hyaline.

On erratic fine-grained pink granite, biotite-sericite, orthoclase-sericite-siderite schist, sericite schist, and fine-grained dike.

The systematic position of this species is not clear. The algae do not penetrate the amphithecium as is usual in lecanorine apothecia. On the other hand, there seems to be a differentiation of tissues corresponding to amphithecium and parathecium, the amphithecium being of thalline derivation while the parathecium is connected with the hypothecium. Since no algae occur above the hypothecium in the margin, some might refer the species to *Kuttlingeria*. It is possible, however, that it should be referred to **Xanthoria antarctica** (Vainio) Dodge & Baker, comb. nov. [*Xanthoria lychnea* f. *antarctica* Vainio, Exp. Antarct. Belge Res. Voy. S.Y. Belgica, Bot. Lichens, 22. 1903] on account of the thick continuous center of the thallus and its rhizinae. The latter species has lacerate and granulate

lobes and is sterile, while *G. Siplei* has smooth lobes and is abundantly fruiting. Immature spermogonia on our plant would also suggest reference to *Xanthoria* since they apparently occur in groups of 3–5 immersed in thalline warts at the tips of the lobes rather than singly immersed in the thallus as in *Gasparrinia*. The wall is thin, hyaline, very deeply staining, and the contents are not completely differentiated.

MARIE BYRD LAND: Edsel Ford Range, Skua Gull Peak, *P. Siple & S. Corey 72W-6*, type, *72W-7*, *72W-14*; Mt. Stancliff, *P. Siple & S. Corey 72A-1*; Mt. Donald Woodward, *P. Siple, F. A. Wade, S. Corey & O. D. Stancliff DW-2*.

GASPARRINIA **cirrochrooides** (Vainio) Dodge & Baker, comb. nov.

Placodium cirrochrooides Vainio, Res. Voy. S.Y. Belgica, 1897–1899, Bot. Lich. 24. 1903.

Caloplaca (Gasparrinia) cirrochrooides Zahlbr., Cat. Lich. Univ. 7: 225. 1931.

Type: Graham Land Archipelago, Danco Land, Cape Anna Osterrieth, 64° 33′ S., *E. G. Racovitsa*.

GASPARRINIA **inordinata** (Hue) Dodge & Baker, comb. nov.

Lecanora (Placodium) inordinata Hue, Deuxième Exp. Antarct. Franç. Lich. 70. 1915.

Placodium inordinata Darbishire, Brit. Antarct. [Terra Nova] Exp. 1910. Bot. 53. 1923.

Caloplaca (Gasparrinia) inordinata Zahlbr., Cat. Lich. Univ. 7: 241. 1931.

Type: South Shetlands, Deception Island, *Gain 73*.

GASPARRINIA **Joannae** (Hue) Dodge & Baker, comb. nov.

Lecanora (Placodium) Joannae Hue, Deuxième Exp. Antarct. Franç. Lich. 68. 1915.

Placodium Joannae Darbishire, Brit. Antarct. [Terra Nova] Exp. 1910. Bot. 53. 1923.

Caloplaca (Gasparrinia) Joannae Zahlbr., Cat. Lich. Univ. 7: 241. 1931.

Type: Graham Land, Booth-Wandel Island, *Gain 119*.

GASPARRINIA **lucens** (Nylander) Dodge & Baker, comb. nov.

Lecanora elegans f. *lucens* Nylander ap. Crombie, Jour. Linn. Soc. Bot. 15: 184. 1876.

Placodium lucens Nylander, Lich. Nov. Zelandiae, 145. 1888.

Caloplaca (Gasparrinia) lucens Zahlbr., Deutsch. Südpolar Exp. 1901–1903, 8: 29. 1906.

Type: Kerguelen Land, Observatory Bay, *A. E. Eaton.*

GASPARRINIA **sublobulata** (Nylander) Dodge & Baker, comb. nov.

Placodium sublobulatum Nylander, Lich. Fueg. Patagon. 7. 1887.

Lecanora (Placodium) sublobulata Hue, Deuxième Exp. Antarct. Franç. Lich. 69. 1915.

Caloplaca (Gasparrinia) sublobulata Zahlbr., Cat. Lich. Univ. 7: 267. 1931.

Type: Staten Island, *C. Spegazzini.*

POLYCAULIONA

POLYCAULIONA Hue, Exp. Antarct. Franç. (1903–1905) Sci. Nat. Lich. 8. 1908.

Placodium sect. *Thamnoma* Tuckerman, Gen. Lich. 107. 1872.

The type species is *Polycauliona regalis* (Vainio) Hue. The type of *Placodium* sect. *Thamnoma* is *Placodium coralloides* Tuckerman.

Thallus fruticulose, yellow to chestnut, structure radiate, erect or decumbent at the periphery, dichotomous or irregularly branched, branches often short and nodulose; cortex completely surrounding the thallus, duplex, the outer zone amorphous, from hyphae perpendicular to the axis, the inner more branched and much more slender; algae *Protococcus,* medulla of hyphae parallel to the axis, closely conglutinate. Apothecia terminal on the main axis or branches, constricted at the base, concave then flattened, disc orange; amphithecium and parathecium well developed; hypothecium hyaline; paraphyses hyaline, yellow, or rufous above; asci cylindric or somewhat ventricose in the middle, base caudate, 8-spored; spores hyaline, unicellular or polaribilocular. Spermogonia terminal on the axis and branches, round, spermatia cylindric, straight, septate.

Our species differ from those previously referred to *Polycauliona* in having the central portion of the medulla so loosely woven as to appear almost hollow, much as the section *Eumitria* differs from the other sections of *Usnea*.

KEY TO ANTARCTIC SPECIES

Spores unicellular; thallus brown .... *P. Charcoti*
Spores polaribilocular.
  Thallus greenish .... *P. luctuosa*
  Thallus yellow.
    Thallus erect, up to 30 mm. high .... *P. regalis*
    Thallus prostrate, 3 mm. high.
      Lobes terete .... *P. regalis* f. *prostrata*
      Lobes flattened, subcanaliculate .... *P. coralligera*
  Thallus scarlet to deep orange above.
    Thallus in large pulvinate tufts .... *P. pulvinata*
    Thallus small, scattered, often growing over other lichens and mosses .... *P. sparsa*

POLYCAULIONA **pulvinata** Dodge & Baker, sp. nov.
Pl. 54, figs. 276–280; pl. 65, fig. 430.

Type: Marie Byrd Land, Edsel Ford Range, Mt. Rea-Cooper, *P. Siple, F. A. Wade, S. Corey & O. D. Stancliff R-3.*

Thallus suffruticosus, dense pulvinatus, ad 25 mm. diametro, 7–8 mm. altitudine, lobis torulosis applanatisve, intricate ramosis, aurantiacus cadmii aut capucino-flavus, subtus dilute flavo-aurantiacus; cortex 30–50 μ crassitudine, cellulis 2–5 μ diametro, isodiametricis, cum strato cellularum emortuarum ad 5 μ crassitudine; algae ad 12 μ diametro, protococcoideae, singulae aut in coloniis parvis per totum thallum sparsae; medulla ad 250 μ crassitudine, funiculis hypharum leptodermaticarum circa 2 μ diametro, laxe intertextis; cortex inferior 30–65 μ crassitudine, cortici superiori similis.

Apothecia ad 1 mm. diametro, marginata, concava, aurantiaca Martis aut rufa Anglorum; amphithecium 90–100 μ crassitudine; cortex ei thalli similis; algae coloniis parvis sparsae; parathecium non evolutum; hypothecium 20–30 μ crassitudine, hyalinum, hyphis dense compactum, non tenuescens; thecium 60–70 μ altitudine; paraphyses 1 μ diametro, capitibus 3.5–4.0 μ, obovoideis vel subsphericis, ad apicem repetito ramosi; asci 52–56 × 18–21 μ, clavati, vaginati; ascosporae octonae, 11–14 × 6–7 μ, ellipsoideae, uniseptatae, hyalinae.

Thallus dwarf-fruticose, in dense pulvinate tufts up to 25 mm. in diameter, 7–8 mm. tall, lobes torulose or flattened and intricately branched so that it is impossible to trace the older branches, cadmium orange to capucine yellow, below paler, capucine buff to pale yellow-orange; cortex 30–50 μ thick, of isodiametric cells 2–5 μ in diameter, covered by a layer of dead

cells up to 5 μ thick; algae up to 12 μ, protococcoid, scant, single or in small colonies scattered throughout the thallus; medulla up to 250 μ thick, of strands of thin-walled branched hyphae 2 μ in diameter, loosely interwoven and almost lacking in the center; lower cortex 30–65 μ thick, continuous and identical with the upper cortex. Occasionally foreign algae occur in great patches on the under side, but since they seem to be devoid of hyphae they can scarcely be regarded as true cephalodia.

Apothecia up to 1 mm. in diameter, marginate, concave especially when young, Mars orange to English red; amphithecium 90–100 μ thick, cortex identical and continuous with that of the thallus; algae scattered throughout in small colonies; medulla similar to that of the thallus; parathecium not differentiated; hypothecium 20–30 μ thick, hyaline, denser than the medulla, not tapering much; thecium 60–70 μ tall; paraphyses 1 μ in diameter, tips 3.5–4 μ, more or less racquet-shaped or sometimes almost subspherical, often repeatedly branched near the tips, not darkened; asci 8-spored, 52–56 × 18–21 μ, slender-clavate with a moderate sheath; ascospores 11–14 × 6–7 μ, ellipsoidal, 2-celled, each cell distinct with its own nucleus, hyaline.

On biotite-sericite schist, fine-grained dike, and highly metamorphosed sedimentary rocks.

Marie Byrd Land: Edsel Ford Range, Mt. Rea-Cooper, *P. Siple, F. A. Wade, S. Corey & O. D. Stancliff R-3*, type; Mt. Donald Woodward, *P. Siple, F. A. Wade, S. Corey & O. D. Stancliff DW-2;* Mt. Stancliff, *P. Siple & S. Corey 72A-1;* Skua Gull Peak, *P. Siple & S. Corey 72W-6, 72W-7, 72W-14.*

Polycauliona **sparsa** Dodge & Baker, sp. nov.

Pl. 54, figs. 281–286.

Type: Marie Byrd Land, Skua Gull Peak, *P. Siple & S. Corey 72W-5.*

Thallus suffruticosus aut herpetiformis super lichenibus muscisque, lobis gracilibus, paullo ramosis, torulosis vel subapplanatis, raro ad 0.5 mm. diametro, coccineus, subtus salmoneo-aurantiacus; cortex 10–15 μ crassitudine, cellulis isodiametricis, exteris obscuris; algae ad 15 μ diametro protococcoideae, sub cortice sparsae aut in strato 20–30 μ crassitudine sub hypothecio; medulla 200–300 μ crassitudine, funiculis hypharum 2–4 μ diametro, ramosarum reticulatim, densius

sub apothecio corticeque laxissime loborum centro dispositis; cortex inferior superiori similis.

Apothecia ad 1 mm. diametro, plana convexave, marginata, juventute inflexa, coccinea, sessilia, singula; amphithecium 60–80 μ crassitudine, thallo simile; parathecium circa 20 μ crassitudine, hyphis tenuibus flavis dense compactum; thecium 40–50 μ altitudine; paraphyses 1 μ diametro, moniliformes, ramosi, cellulis brevibus, ovoideis, penultima quam ultima majore, ad 3 μ diametro, epithecium hyalinum, KOH addito coccineum; asci 42–48 × (10–)14–16 μ, obtuse clavati; ascosporae octonae, 12–15 × 6–8 μ, polaribiloculares, cellulis separatis, uninucleatis, ellipsoideae, hyalinae.

Thallus dwarf-fruticose or growing over other lichens and mosses, lobes slender, sparingly branched, torulose or somewhat flattened, rarely reaching 0.5 mm. in width, scarlet, below salmon orange; cortex 10–15 μ thick, of isodiametric cells, the outermost darkened; algae up to 15 μ in diameter, protococcoid, scattered in the thallus below the upper cortex and massed in a layer 20–30 μ thick below the hypothecium; medulla about 200–300 μ thick, of strands of hyphae 2–4 μ in diameter, frequently branched in a loose net, denser below the apothecium; lower cortex identical with the upper cortex.

Apothecia up to 1 mm. in diameter, flattened to convex with a small margin, inrolled when young, scarlet, sessile on the lobes, single and scattered; amphithecium 60–80 μ thick, cortex and medulla continuous with those of the thallus and of the same structure; algae scattered in the medulla; parathecium about 20 μ thick, of hyaline hyphae with fastigiately branched tips; hypothecium 10 μ, yellowish, of compact hyphae; thecium 40–50 μ tall; paraphyses 1 μ in diameter, branched, almost moniliform, cells ovoid, the penultimate usually larger than the ultimate which are up to 3 μ in diameter, epithecium hyaline becoming bright red with KOH; asci 42–48 × (10–)14–16 μ, bluntly clavate, 8-spored; ascospores 12–15 × 6–8 μ, polaribilocular, the cells separate and uninucleate, ellipsoidal to somewhat curved, hyaline. At maturity the spores lie free in the gelified ascus, but when young with a distinct protoplasmic sac within the gelified sheath.

Growing on lichens and mosses and on orthoclase-sericite-siderite schist, and often parasitized by *Thelidium Caloplacae*.

MARIE BYRD LAND: Edsel Ford Range, Skua Gull Peak, *P. Siple & S. Corey 72W-5*, type, *72W-6*, *72W-14*.

Buelliaceae

Thallus crustose to squamose, simple or effigurate, without rhizinae, attached to the substrate by the hyphae of the prothallus or the medulla; cortex variable, evanescent in some species; algae protococcoid; medulla loosely woven, of thin-walled hyphae. Apothecia circular, immersed or sessile, lecideine or lecanorine; paraphyses simple or branched; asci normally 8-spored; spores smoke gray to brown, 2–4-celled or muriform, few-celled by division of one or more middle cells, usually with a thick wall, without a gelified sheath as in Lecideaceae, with which they may be confused. Spermatia short, straight.

KEY TO ANTARCTIC GENERA

Apothecia lecideine..BUELLIA
  Spores 2-celled, occasionally one- or three-celled.
    Thallus not effigurate..*Eubuellia*
    Thallus effigurate...*Diploicia*
  Spores 4-celled or few-celled, muriform, not effigurate............*Diplotomma*
Apothecia lecanorine...RINODINA
  Hypothecium dark-colored; spores polaribilocular.....................*Orcularia*
  Hypothecium hyaline.
    Spore-wall thick.
      Lumen of spore round or with rounded angles................*Eurinodina*
        Spores 2-celled...*Pachysporaria*
        Spores 4-celled...*Conradia*
      Lumen of spore cordiform or blunt corniform, hyaline until late......
        ....*Mischoblastia*
    Spore-wall thin, no isthmus; spores small, 2-celled.
      Thallus uniform; apothecia immersed...........................*Melanaspicilia*
      Thallus effigurate...*Beltraminia*

BUELLIA

Buellia DeNotaris, Giorn. Bot. Ital. II. 1[1]: 195. 1846.

The type species was not designated. Of the three species first treated *B. canescens* (Dicks.) DNtrs. may be eliminated as it belongs in sect. *Diploicia* which is sometimes treated as a separate genus. Of the two remaining in sect. *Eubuellia* Clements & Shear (Gen. Fung. 323. 1931) have chosen *B. parasema* DNtrs.

Thallus crustose, simple, margins sometimes effigurate, seldom squamulose, attached to the substrate by the hyphae of the

medulla or prothallus, without true rhizinae; with a fastigiate cortex often evanescent, or more rarely with a pseudoparenchymatous cortex; algae *Protococcus;* medulla of reticulately woven thin-walled hyphae, occasionally sorediate. Apothecia immersed, appressed or sessile, lecideine, black, without algae; hypothecium usually dark or carbonaceous; paraphyses often capitate, epithecium dark; asci usually 8-spored; ascospores brown to black, ellipsoid or elongate, 2–4-celled or slightly muriform from division of the middle cells (in section *Diplotomma)* with a thick wall and without a sheath (distinction from *Rhizocarpon* of the Lecideaceae).

Three sections are commonly recognized, for characters of which see preceding key. This genus contains the largest number of species of any genus found in the Antarctic, thirty-seven having been reported from the Antarctic Archipelago and ten from South Victoria Land, to which we have added twelve new ones from Marie Byrd Land and King Edward VII Land, and one from the Queen Maud Mts. in South Victoria Land.

KEY TO ANTARCTIC SPECIES

Spores 4-celled to few-celled muriform, not effigurate .... DIPLOTOMMA
  A single species .... *B. Siplei*
Spores 2-celled, rarely one- or three-celled, not effigurate .... EUBUELLIA
  Thallus some shade of yellow.
    Thallus yellowish brown.
      Spores 17–25 μ .... *B. isabellina*
      Spores 11–17.5 μ.
        Margin digitate, lacinulate; parathecium 30–40 μ; thecium 70–80 μ ... . *B. radians*
        Margin confervoid; parathecium thinner; thecium 90–120 μ .... *B. olivaceobrunnea*
    Thallus light yellow.
      Spores 14–20 μ .... *B. modesta*
      Spores 10–14 μ.
        Non-assimilative areolae black; apothecium 1 mm.; hypothecium fuscous .... *B. adarensis*
        Non-assimilative areolae absent; apothecium 0.27 mm.; hypothecium hyaline or light brown .... *B. pallida*
        Non-assimilative areolae white; apothecium 0.56 mm. .... *B. grisea*
    Thallus bright yellow.
      Spores 15–20 μ .... *B. Nelsoni*
      Spores over 20 μ.
        Apothecia up to 2 mm. in diameter .... *B. anisomera*

Apothecia 1 mm. in diameter.
Thallus areolate .... *B. cremea*
Thallus granulose to squamulose .... *B. inordinata*
Apothecia up to 0.6 mm. in diameter .... *B. citrella*
Spores up to 16 μ long; areolae yellow.
Tops flat with black margins .... *B. flavoplana*
Tops rounded, margins not black.
Apothecia up to 0.4 mm. in diameter, assimilative areolae up to 1 mm. .... *B. superba*
Apothecia up to 0.8 mm.; assimilative areolae up to 0.75 mm... *B. chrysea*
Apothecia up to 1 mm.; assimilative areolae 2–3 mm., 1.5 mm. high; thallus with small black sterile areolae .... *B. variabilis*
Apothecia up to 1.5 mm.; assimilative areolae 2–3 mm., 0.25 mm. high; thallus with black non-assimilative margin, rugose to confervoid .... *B. tristis*
Thallus of some other color.
Growing over soil and mosses.
Thallus pale or white; ascospores large .... *B. parasema*
Thallus red-brown or darker; ascospores 11–15 × 4.5–7 μ; hypothecium dark brown .... *B. muscicola*
Saxicolous.
Spores more than 30 μ long.
Thallus brownish white; warts 3–4 mm. high .... *B. subpedicellata*
Thallus pure white; warts much smaller .... *B. Goudieri*
Spores less than 30 μ long.
Hypothecium hyaline.
Spores more than 20 μ long.
Margin of non-assimilative area not distinct; thallus 1 mm. thick .... *B. conspicua*
Margin of non-assimilative area black; thallus 0.5 mm. thick.... .... *B. melanostola*
Spores less than 20 μ.
Thallus mainly confervoid.
Assimilative areolae white; apothecium 0.6 mm.; spores 9–12 × 5–7 μ .... *B. stellata*
Assimilative areolae olive brown.
Apothecium 0.25 mm.; spores 12–14 × 8–10 μ... *B. pycnogonoides*
Apothecium 0.33 mm.; spores 9–9.5 × 5.5–6.5 μ... *B. brunnescens*
Thallus of small white separate areolae; spores 13–15 × 8–9 μ .... *B. evanescens*
Thallus of stellate white radiating strands; spores 8–10 × 4–6 μ .... *B. alboradians*
Thallus continuous or nearly so.
Thallus white, light gray or brown, areolate.
Spores 16–20 × 5.5–7 μ .... *B. Russellii*
Spores 11–13(–16) × (8–)9–11 μ .... *B. dimorphota*
Spores 10–15.5 × 5.5–7 μ .... *B. grisea*
Spores 8–9.5 × 4.5–6 μ .... *B. floccosa*

Thallus and apothecia black.
Assimilative thallus tuberculate and continuous, showing little non-assimilative thallus; spores 10–12 × 6–8 μ.... ....B. pernigra
Assimilative thallus scattered, tuberculate; non-assimilative thallus well developed, continuous or reticulate toward the margin; spores 8–10(–13) × 5–6(–7.5) μ...B. dendritica
Hypothecium brown.
Margin of non-assimilative thallus white..............B. latemarginata
Margin of non-assimilative thallus brownish.
Thallus thick, brown..................................B. augusta
Thallus thin, whitish..............................B. protothallina
Margin of non-assimilative thallus not as above.
Margin indistinct.
Spores less than 16 μ long.
Thallus thick, maculate...........................B. frigida
Thallus thin.
Thallus continuous..............................B. quercina
Thallus not continuous, whitish.....................B. albida
Spores 16–28 μ.
Thallus white.................................B. imperfecta
Thallus brownish...................................B. russa
Thallus not as above.
Apothecia up to 0.4 mm.......................B. polychroa
Apothecia up to 1 mm.........................B. melampoä
Spores up to 28 μ.............................B. dichromatina
Margin distinct.
Margin dendritic.
Thallus whitish.
Spores brown......................................B. Gainii
Spores black.
Margin 2–3 mm. broad.......................B. margaritae
Margin 5–6 mm. broad........................B. Liouvillei
Thallus grayish.
Spores black.....................................B. Tuxenii
Spores brownish.
Hypothecium black...................B. caesiocinerescens
Hypothecium brownish.
Thallus up to 0.8 mm. thick...................B. perlata
Thallus up to 1 mm. thick................B. endomelaena
Margin not dendritic.
Spores over 20 μ long.
Spores black...............................B. Petermanni
Spores not black.
Non-assimilative margin very narrow......B. acarosporoides
Non-assimilative margin up to 1 mm.........B. festivissima
Spores less than 20 μ long.
Thallus up to 0.5 mm. thick.
Apothecia up to 1 mm. in diameter..........B. actinoloba

Apothecia up to 0.5 mm. in diameter.........*B. brabantica*
Thallus much thinner.
Thallus dark gray...........................*B. Charcoti*
Thallus brownish............................*B. Joannae*

BUELLIA **Siplei** Dodge & Baker, sp. nov.
Pl. 60, figs. 376–377; pl. 61, figs. 378–380.
Type: Marie Byrd Land, Edsel Ford Range, Mt. Rea-Cooper, *P. Siple, F. A. Wade, S. Corey & O. D. Stancliff R-6.*

Thallus inter muscos in solo, inconspicuus, albus vel brunnescens, gelifactus madefactus, mollis, crustosus vel granulosus; cortex superior cellulis fastigiatis, superficie subobscurascente; stratum gonidiale basale, circa 160 μ crassitudine, algis abundantibus parvis, ad 3 μ diametro; medulla 350 μ crassitudine, hyphis hyalinis, circa 2 μ diametro, laxe reticulatimque dispositis, circum algas compactioribus; cortex inferior cortici superiori similis, saepe cum cephalodiis hypogenis Rivulariaceis, ad 150 μ crassitudine sub thallo apotheciisque.

Apothecia ad 1.5 mm. diametro, plerumque circa 0.45 mm. diametro, irregularia, applanata vel concava, marginata, subnitida, grisea vel nigra, rara; parathecium 20–30 μ crassitudine, pseudoparenchymaticum, cellulis ad 7 μ diametro, obscuris pachydermaticisque, in hypothecium mergens; hypothecium ad 25 μ crassitudine, cellulis obscure brunneis reticulatis compactis; thecium ad 50 μ altitudine; paraphyses ad 0.75 μ diametro, graciles, ramosi, gelifacti, apicibus non inflatis, hyalinis; epithecium 8–15 μ crassitudine, gelifactum, obscure brunneum; asci 38–47 × 11–15 μ, elongato-clavati vel maturitate late-clavati, apicibus vaginatis; ascosporae 15–26 × 4–5 μ, ovoideae dein elongatae, 2–8-cellulares, frequenter 4-cellulares, obscure brunneae.

Assimilative areolae over areas of a few mm. among mosses on soil and gravel, inconspicuous, white to brownish, gelified when moist, soft, crustose to granulose; upper cortex represented by scattered fastigiate cells slightly darkened at the outer edges; algal layer basal, about 160 μ thick, cells very numerous, small, up to 3 μ in diameter; medulla 350 μ thick, of loosely reticulate hyaline hyphae about 2 μ in diameter, more compact about the algal cells; basal cortex not morphologically differentiated from the upper cortex, consisting of a few scattered fastigiate cells, sometimes with extensive hypogenous cephalodia of *Rivularia,* up to 150 μ thick, below the thallus and the apothecia.

Apothecia up to 1.5 mm., usually about 0.45 mm. in diameter, irregular, flat to concave, margined, somewhat shining, gray to black, not numerous; parathecium 20–30 μ thick, of large dark thick-walled cells up to 7 μ in diameter, pseudoparen-

chymatous, extending evenly about the apothecium and merging with the hypothecium below; hypothecium up to 25 μ thick, of small dark brown cells, reticulate, compact, thinning laterally to merge with the parathecium; thecium about 50 μ tall; paraphyses about 0.75 μ in diameter, slender, branching, not much inflated at the tips, closely united in a gel, hyaline, not darkened on the outside; epithecium 8–15 μ, gelified, dark brown; asci 38–47 × 11–15 μ, 8-spored, elongate-clavate, becoming broadly clavate at maturity, gelified sheath prominent over the tip; ascospores 15–26 × 4–5 μ, short-ovoid at first becoming elongate with one end tapering, divided transversely into from 2 to 8 (mostly 4) cells, dark brown.

On soil and sericite-orthoclase schist.

MARIE BYRD LAND: Edsel Ford Range, Mt. Rea-Cooper, *P. Siple, F. A. Wade, S. Corey & O. D. Stancliff R-6*, type; Lichen Peak, *P. Siple & S. Corey 73-7.*

BUELLIA **olivaceobrunnea** Dodge & Baker, sp. nov.

Pl. 58, figs. 340–347.

Type: Marie Byrd Land, Edsel Ford Range, Skua Gull Peak, *P. Siple & S. Corey 72W-15.*

Thallus non assimilans 1–3 × 0.5–2.5 cm., adpressus, marginatus, saepe tenuescens, non elevatus, confervoideus, raro albomaculatus, cellulis emortuis corticalibus, continuus, niger; cortex superior ad 30 μ, cellulis sphericis non angularibus; medulla hyphis reticulatis; stratum basale cellulis sphericis; areolae assimilantes ad 0.5 mm., pustulares aut elongatae, irregulares, angulares applanataeque, raro radiatim diffractae, gregariae, sparsae aut etiam singulae in area centrali, obscure olivaceobrunneae vel citrino-ravae; cortex superior 10–30 μ, fastigiatus, capitatus, cellulis magnis pachydermaticis in duobus vel tribus stratis evanescentibus; stratum gonidiale 50 μ, cellulis ad 7 μ diametro; medulla 100–150 μ, reticulata; stratum basale 10–30 μ, cellulis sphericis.

Apotheeia ad 0.5 mm. diametro, circularia, raro angularia, emarginata, unum vel plura in quaque areola, gregaria vel immersa, sessilia, nigra; cortex medullaque desunt; hypothecium 50–100 μ crassitudine centro, ad margines tenuescens, obscurum, reticulatum, basi subsolido; thecium 90–120 μ crassitudine; paraphyses 2–4 μ, ramosi, apicibus non inflatis, obtusi, cellulis pachydermaticis vaginatis, epithecium 5–8 μ crassitudine, obscurum; asci (50–)70–96 × (14–)18–28 μ, elongati, clavati, vaginati; ascosporae octonae, 13–17.5 × 6–11 μ, uniseptatae, raro aseptatae, obtusae vel longiores et acutae, constrictae, obscurae.

Non-assimilative portions covering areas 1–3 × 0.5–2.5 cm. closely applied to the rock, margin distinct, often thinning out, not raised, confervoid, occasionally with whitish patches of dead cortical cells, usually continuous and making a conspicu-

ous border, black; upper cortex about 30 μ, of spherical cells not angled by pressure but making a compact tissue; medulla of similar cells in a very loose open network; basal layer similar to the upper cortex; assimilative areolae up to 0.50 mm., pustular and circular in outline or irregularly elongate, angular and flattened, sometimes radially cracked, often showing a thin encrusting black layer on the upper surface and in older collections entirely blackened, massed or scattered to single in central portion, dark olive brown to citrine drab; upper cortex 10–30 μ thick, of two or three layers of thick-walled cells which disappear, leaving a palisade of small thin-walled, compact cells without a definite outer zone; algal layer 50 μ thick, cells up to 7 μ in diameter; medulla 100–150 μ, of loose hyphae in a definite reticulate arrangement; basal layer 10–30 μ, similar to the basal layer of the non-assimilative portions.

Apothecia up to 0.5 mm., usually circular in outline, sometimes angled by mutual pressure, without a prominent rim, one to several on an assimilative areola, usually gregarious, sessile or immersed; cortex and medulla absent; parathecium a few differentiated cells merging laterally into the cortex of the thallus; hypothecium 50–100 μ thick at the center, thinning toward the parathecium, dark, of close reticulations, almost solid at the base; thecium 90–120 μ thick; paraphyses 2–4 μ, only slightly inflated at the tips, often much branched, blunt with a dark encrusting layer on the outer surface, cells thick-walled, sheath conspicuous, epithecium 5–8 μ thick, dark; asci (50–)70–96 × (14–)18–28 μ, 8-spored, very elongate-clavate, with well-developed sheath (size is very variable but spores from the same collection are very constant despite this variation); ascospores 13–17.5 × 6–11 μ, 2-celled although occasionally not divided, blunt to more elongate and pointed (variations occur in the same section), constricted at the septum or not, dark.

On coarse-grained pink granite, quartzite, and dark greenish-gray slate.

King Edward VII Land: Rockefeller Range, Mt. Helen Washington, *P. Siple, F. A. Wade, S. Corey & O. D. Stancliff HW-15.*

Marie Byrd Land: Edsel Ford Range, Skua Gull Peak, *P. Siple & S. Corey 72W-7, 72W-15*, type, *72W-16*; Mt. Stancliff, *P. Siple & S. Corey 72A-2.*

Buellia **pallida** Dodge & Baker, sp. nov. Pl. 56, figs. 318–321.
Type: Marie Byrd Land, Edsel Ford Range, Haines Mts., *P. Siple & F. A. Wade H-3.*

Areolae assimilantes sparsae vel gregariae, ad 2–5 mm. diametro, irregulares, subpulvinatae, ad 0.25 mm. longitudine, dilute luteae vel albidae, nigro-marginatae, cortex ad 10 μ crassitudine, hyphis brunneis magnis; algae sparsae; medulla 120–150 μ crassitudine, hyphis laxe implexis; stratum basale circa 10 μ crassitudine, non bene evolutum obscurius compactiusque.

Apothecia circa 0.27 mm. diametro, sessilia, applanata vel concava, marginata, rara, nigra, carbonacea; cortex 18–20 μ crassitudine, niger, pseudoparenchymaticus; parathecium non bene evolutum; hypothecium 40–50 μ, tenuescens et cum cortice concrescens, hyalinum vel dilute brunnescens; thecium circa 50–55 μ altitudine; paraphyses 1–1.5 μ, capitibus circa 3 μ diametro, nigrescentibus, ramosi vel non ramosi, epithecium circa 5 μ, obscurum; asci 30–40 × 13–20 μ, late clavati; ascosporae (9–)10–13 × 5–6.5 μ, octonae, uniseptatae, raro septo constrictae, obtusae, obscurae.

Non-assimilative portions of thallus not developed; assimilative areolae scattered or gregarious, covering areas up to 2–5 mm., irregular in outline, somewhat pulvinate, up to 0.25 mm. long, pale yellowish to white, usually black-margined; cortex of coarse dark hyphae up to 10 μ thick; medulla of loose spongy tissue, 120–150 μ; algae scattered; basal layer about 10 μ thick, not much differentiated from the medulla but slightly darker and more compact.

Apothecia about 0.27 mm. in diameter, circular, sessile, flat or concave, margined, black, carbonaceous, rare; cortex 18–20 μ thick, black, pseudoparenchymatous; medulla about 35 μ thick above the algae which gradually die out in the center under the apothecium and persist along the margin, of the same texture as that of the thallus; parathecium not well differentiated; hypothecium 40–50 μ thick in the center, tapering laterally until it merges with the cortex, hyaline or very pale brown, of compact periclinal hyphae; thecium about 50–55 μ tall; paraphyses 1–1.5 μ, expanding to heads about 3 μ in diameter, branched or unbranched, epithecium dark brown, about 5 μ thick; asci 30–40 × 13–20 μ, 8-spored, short, broadly clavate, shortening with maturity as the contents swell; ascospores (9–)10–13 × 5–6.5 μ, 2-celled, rarely constricted at the septum, mostly blunt, dark brown.

On pitted sericite schist, brownish with iron.

MARIE BYRD LAND: Edsel Ford Range, Haines Mts., *P. Siple & F. A. Wade H-3*, type.

BUELLIA **grisea** Dodge & Baker, sp. nov. Pl. 59, figs. 354–357. Type: Marie Byrd Land, Edsel Ford Range, Haines Mts., *P. Siple & F. A. Wade H-1.*

Thallus non assimilans ad 1.5 cm. diametro, radiatus, saxicola, lobatus, griseus vel albus, marginibus nigris; cortex fastigiatus, cellulis brunneis, insuper evanescens; medulla laxa, cellulis irregularibus; stratum basale pseudoparenchymaticum, obscurum; areolae assimilantes lobatae, ad 1.75 mm. diametro, irregulares, dichotome ramosae, marginibus impendentibus, radiatim diffractae, ad centrum thalli diffusae sparsaeque, albae, lutescentes vel griseae, marginibus dilutioribus; cortex fastigiatus, in apicibus areolarum evanescens; stratum gonidiale 60 μ, coloniis 14–16 μ diametro, sparsis, protococcoideis; medulla 35–40 μ crassitudine, hyphis laxe implexis; stratum basale non bene evolutum, cellulis obscurioribus.

Apothecia ad 0.56 mm. diametro, irregulariter hemispherica, convexa, sessilia singulaque quoque in areolis, sparsa, nigra, carbonacea; cortex cellulis pachydermaticis, pseudoparenchymaticus; hypothecium ad 50 μ crassitudine, non tenuescens; parathecium deest; thecium 60–70 μ; paraphyses 1–1.5 μ, apicibus ad 2 μ, nigro-incrustatis; asci 36–46 × 14–16 μ, elongato-clavati, vaginati; ascosporae octonae, uniseptatae, 10–13.5 × 5.5–7 μ, brunneae.

Non-assimilative thallus up to 1.5 cm. in diameter, radiate, saxicolous, lobed, gray to white, margins black; cortex fastigiate, of dark cells thinning out over the tops of the lobes; medulla of loose irregular hyphae; basal layer represented by scattered dark isodiametric cells; assimilative thallus of distinct lobes up to 1.75 mm. across, irregular, often dichotomously branched, overhanging at the margins, radiately cracked, becoming diffused and scattered toward the center, white to yellowish or gray, margins usually lighter in color; cortex fastigiate, breaking away over the tops of the areolae; algal layer 60 μ, colonies 14–16 μ, scattered, protococcoid; medulla 35–40 μ thick, of loosely woven hyphae; basal layer not well developed, occasionally represented by a few dark cells; often sterile, but thalline characters are sufficient for identification.

Apothecia up to 0.56 mm. in diameter, irregularly hemispheric, convex, sessile on the areolae, black, carbonaceous; cortex of thick-walled pseudoparenchyma; hypothecium up to

50 μ thick, not thinning; parathecium only a few cells or not differentiated; thecium 60–70 μ; paraphyses 1–1.5 μ, slightly expanded up to 2 μ at the tips with heavy black incrustations at the outer edges, unbranched or branched, epithecium about 10 μ, dark; asci 36–46 × 14–16 μ, elongate-clavate with a sheath, 8-spored; ascospores 10–13.5 × 5.5–7 μ, with or without a constriction at the septum, blunt or slightly tapering.

On sericite schist, biotite-sericite, orthoclase-sericite schist, brownish with iron.

MARIE BYRD LAND: Haines Mts., *P. Siple & F. A. Wade H-1*, type, *H-2*; Mt. Donald Woodward, *P. Siple, F. A. Wade, S. Corey & O. D. Stancliff DW-5*; Garland Hershey Ridge, *P. Siple & S. Corey 5-2*.

BUELLIA FLAVOPLANA Darbishire, Brit. Antarct. [Terra Nova] Exp. Bot. 3: 38. 1923. Pl. 55, figs. 297–302; pl. 65, fig. 424.

Illustrations: Darbishire, *Ibid.* p. 38, *f. 6; pl. 1, f. 3.*

Type: South Victoria Land, Cape Adare, British Antarctic [Terra Nova] Expedition in British Museum, not seen.

Thallus closely applied to the rock substratum, covering areas 0.5–2.5 cm. in diameter; non-assimilative portion carbonaceous, black, margin determinate, sometimes as much as 0.9 mm. high or thinning out until the edges are distinctly confervoid, forming a continuous layer of different levels but frequently separating into strands in the interior, the pillars flattened, convex or concave, even conical, 50–500 μ in diameter, 90–220 μ high, often capped with dead, white cortical cells, giving the whole area a grayish color in a more or less definite reticulate pattern in contrast to the pure black margin; upper cortex 20–75 μ thick, of the fastigiate type, the capitate hyphal tips forming a dark pseudoparenchymatous layer two or three cells deep, merging gradually with the medulla; over the pillars the cortical cells die, become hyaline and no longer staining with the usual dyes; medulla of loosely woven hyaline hyphae 2–3 μ in diameter; assimilative areolae 0.65–1.35 mm. in diameter or elongate and up to 1.6 mm. long, those sectioned 290–1100 μ in diameter, 90–400 μ tall, chartreuse yellow to whitish, the surface decorticate above, hence slightly floccose, flattened, scattered or so closely associated that they become angu-

lar by mutual pressure; upper cortex continuous with that of the non-assimilative portion, extending only a short way over the edges of the areolae (when young the cortical rim is so pronounced that the areolae appear immersed in the thallus and when an assimilative areola is secondarily divided by cracks, the cortex is completely lacking in the cracks); algal layer 30–40 μ thick, cells protococcoid, mostly in vertical rows, spherical, 7–8 μ in diameter, sheaths up to 14 μ; medulla of loosely associated hyphae continuous with that of the non-assimilative portion, often compactly united in vertical columns which penetrate the algal layer; basal layer 10–15 μ thick, less distinct than the upper cortex, of a few rows of dark cells densely packed.

Apothecia scattered or gregarious, convex to irregularly spherical on separate pillars, sometimes almost stalked, usually sessile to subsessile, 0.22–1.3 mm. in diameter, commonly about 0.67 mm., convex when young with an equatorial fringe of dead, white cortical cells, becoming flattened, usually with a conspicuous margin, sometimes emarginate; cortex and medulla continuous with those of the thallus and of the same texture; parathecium not differentiated; hypothecium of dark closely associated cells, about 40 μ thick at the center, 25 μ at the sides, and disappearing upwards; thecium 60–90 μ thick; paraphyses 2–4 μ in diameter, branched or straight, not capitate, ending in a dark brown epithecial gel 8–10 μ thick, cells short, thick-walled, the whole gelified; asci elongate, broadly clavate, with a prominent gelified sheath, 8-spored, 45–55 × 18–20 μ; ascospores dark, 2-celled with blunt ends, slightly constricted at the septum, sometimes undivided but approximately the same size, 10–16 × 7–9 μ, one cell of the spore sometimes exceeding the other in size.

The assimilative areolae are easily the most conspicuous part of this lichen for they contrast strikingly with the black thallus. Darbishire reported no apothecia exceeding 1 mm., but several larger ones were found in these collections.

On biotite-sericite schist.

MARIE BYRD LAND: Edsel Ford Range, Mt. Donald Woodward, *P. Siple, F. A. Wade, S. Corey & O. D. Stancliff DW-3, DW-5.*

Buellia **chrysea** Dodge & Baker, sp. nov.

Pl. 56, figs. 308–311, 316–317.

Type: Marie Byrd Land. Edsel Ford Range, Mt. Rea-Cooper, *P. Siple, F. A. Wade, S. Corey & O. D. Stancliff R-7.*

Thallus appressus, radians 2–4 mm. diametro, pars non assimilans ad 150 μ crassitudine, nigra; cortex medullaque non bene evoluta, extus nigra, intus hyalina, continua vel dissecta reticulataque juventute; areolae assimilantes ad 0.75 mm. diametro, pustulares, floccosae, irregulares, "marguerite yellow," angulatae, sparsae vel gregariae; cortex fastigiatus, cellulis magnis brunneis, in superficie evanescens et amorphus; stratum gonidiale coloniis sparsis in media vel in basi medullae; medulla hyphis tenuibus laxe reticulatimque implexis, sub apotheciis hyphis brunneis majoribus; stratum basale cellulis parvis brunneis compactius sed plus minusve reticulatum, ad 15 μ crassitudine.

Apothecia ad 0.8 mm. diametro, spherica convexave, marginibus subcrenulatis, sessilia, nigra; cortex 10–15 μ crassitudine, cellulis magnis fastigiatis; hypothecium ad 150 μ crassitudine, obscurissimum, cellulis magnis brunneis reticulatim dispositis; thecium 90–100 μ crassitudine; paraphyses 1–2 μ crassitudine, capitibus ad 6 μ diametro, ramosi, apicibus obscuris, epithecium 10–18 μ, nigrum, rugosum; asci 45–65 × 15–18 μ, clavati, basi longa attenuataque; ascosporae 10–12 × 5.5–7 μ, octonae, uniseptatae, obtusae vel subacutae, brunneae.

Thallus closely attached, spreading more or less radiately over areas of 2–4 mm.; non-assimilative portion up to 150 μ thick, black, dull, cortex and medulla not morphologically differentiated but external layers black, hyaline within, continuous or dissected and reticulate especially in younger stages; assimilative areolae up to 0.75 mm. in diameter, pustular, floccose, irregular, marguerite yellow, angled by pressure when close together, scattered or gregarious; upper cortex not well defined except at the margins of the areolae, fastigiate, of large dark cells not covering the surface of the areolae which is amorphous; algal colonies scattered through the middle and basal portion of the medulla, of reticulate loosely woven hyphae (below the apothecia darker and coarse); basal layer of slightly darkened cells, small, rather compact although more or less reticulate, up to 15 μ.

Apothecia up to 0.8 mm., spherical, convex, with a distinct margin sometimes slightly crenulate, sessile, black, dull; cortex 10–15 μ thick, of large fastigiate cells; hypothecium up to 150 μ thick, very dark, of coarse brown cells in a close reticulum; thecium 90–100 μ tall; paraphyses 1–2 μ in diameter, expand-

ing to heads up to 6 μ in diameter, usually branched, the outer surfaces of the apices darkened, epithecium 10–18 μ, black and rugose; asci 45–65 × 15–18 μ, 8-spored, especially long and slender, clavate, and expanded above, the base remaining attenuate; ascospores 10–12 × 5.5–7 μ, 2-celled, not always constricted at the septum, blunt to somewhat pointed, dark.

On coarse-grained granite.

MARIE BYRD LAND: Edsel Ford Range, Mt. Rea-Cooper, *P. Siple, F. A. Wade, S. Corey & O. D. Stancliff R-7*, type.

BUELLIA **muscicola** Dodge & Baker, sp. nov.

Pl. 59, figs. 348–353.

Type: King Edward VII Land, Rockefeller Mts., Mt. Helen Washington, *P. Siple, F. A. Wade, S. Corey & O. D. Stancliff HW-2, HW-10.*

Thallus non assimilans 1.75 × 0.7 cm., conspicuus, tenuiter dendritice ramosus, obscure rufo-brunneus vel niger, marginibus funiculorum principalium asperatis, ramis brevibus, cellulis obscuris, irregularibus, cortice medullaque non evolutis sed cellulis interis nonnumquam hyalinis; areolae assimilantes ad 0.33 mm., pallidae vel rufo-brunneae, gelifactae, sparsae vel gregariae ad confluentiam funiculorum; cortex mox evanescens; stratum gonidiale in medio thalli, ad 60 μ crassitudine, cellulis 4 μ diametro; medulla hyphis laxe implicatis; stratum basale non evolutum; bulbilli ad 75 μ diametro, spherici, obscuri, numerosi, sparsi vel gregarii, cellulis brunneis pseudoparenchymaticis.

Apothecia ad 0.57 mm. diametro, applanata vel subspherica, nonnumquam marginata, convexa, sessilia vel substipitata, sparsa vel gregaria, nigra, carbonacea; cortex ad 20 μ, bene evolutus, cellulis magnis brunneis; hypothecium 20–50 μ, obscure brunneum; thecium ad 80 μ altitudine; paraphyses 1.5–2 μ, ramosi, capitati, 7–8 capitibus in quoque paraphyse, cellulis 5 μ diametro, brunneis, epithecium ad 10 μ, obscurum, asperum; asci 31–50(–57) × 14–17 μ, clavati, vaginati; ascosporae octonae, 11–15(–17) × 4.5–7 μ, uniseptatae, non constrictae, acutae, distichae juventute, dein irregulares.

Non-assimilative portion 1.75 × 0.7 cm., on rocks or soil among mosses, conspicuous but very slender, branched, spreading, dark reddish brown to black, the edges of the main strands roughened by short side branches, of dark irregular cells; cortex and medulla not differentiated, but the inner cells sometimes hyaline; the assimilative areolae up to 0.33 mm., pale to red brown, pustular, gelified, especially abundant and prominent at the confluence of the non-assimilative branches, gregarious or scattered; cortex soon evanescent; algal layer proto-

coccoid, about 60 μ thick in the middle of the thallus, cells about 4 μ in diameter; medulla of loosely woven hyphae somewhat more developed and more compact under the apothecia; lower cortex not differentiated; asexual reproduction on the non-assimilative portions of the thallus by bulbils up to 75 μ in diameter, spherical, dark, numerous, scattered or in groups, pseudoparenchymatous, of dark cells.

Apothecia up to 0.57 mm. in diameter, flattened to almost spherical, sometimes marginate, usually convex, sessile to substipitate, scattered or gregarious, black, carbonaceous; cortex up to 20 μ thick, well developed, of large dark cells; hypothecium 20–50 μ, dark brown, parathecium not differentiated although a few cells can be traced from the margin of the hypothecium to the cortex; thecium up to 80 μ; paraphyses 1.5–2 μ, much branched, the larger expanded, heads arranged in a group of 7–8 suggesting a candelabrum, individual heads about 5 μ in diameter, the walls darkened with a brown cap, epithecium up to 10 μ, dark, rough; asci 31–50(–57) × 14–17 μ, 8-spored, clavate, with a gelified sheath; ascospores 11–15(–17) × 4.5–7 μ, 2-celled, not constricted, pointed, nearly distichous when young, irregularly distributed at maturity.

In our preliminary study of this material, we separated that from Marie Byrd Land as a distinct species, since it differs in longer, narrower asci in all stages of development and in slightly larger spores with greater development of the non-assimilative portions; but without a more precise knowledge of the range of variation from a study of more material than is available, we are inclined to regard them as conspecific.

On soil, quartz crystals, and sericite-orthoclase schist.

King Edward VII Land: Rockefeller Mts., Mt. Helen Washington, *P. Siple, F. A. Wade, S. Corey & O. D. Stancliff HW-2, HW-7, HW-10*, type.

Marie Byrd Land: Edsel Ford Range, Haines Mts., *P. Siple & F. A. Wade H-3; Skua Gull Peak, P. Siple & S. Corey 72W-9, 72W-13;* Lichen Peak, *P. Siple & S. Corey 73-1.*

Buellia **stellata** Dodge & Baker, sp. nov.

Pl. 55, fig. 303; pl. 56, figs. 304–307.

Type: Marie Byrd Land, Edsel Ford Range, Haines Mts., *P. Siple, F. A. Wade, S. Corey & O. D. Stancliff DW-3.*

Thallus parvus, appressus, saxicola; pars non assimilans radians ex partibus assimilantibus vel apotheciis, funiculosa, cellulis nigris vel in funiculis magis evolutis etiam cellulis medullaribus laxis; areolae assimilantes ad 0.33 mm., hemisphericae vel elongatae, applanatae, singulae vel binae ternaeve, albae vel sordidae, lateribus nigrescentibus per extensionem cellularum corticarum nigrarum ex funiculis; cortex ad 5 μ crassitudine, cellulis brunneis nigrisve, insuper strato cellularum hyalinarum emortuarum tectus; stratum gonidiale ad 40 μ crassitudine, cellulis in coloniis plus minusve sphericis, subangularibus, 4–6 μ diametro; medulla circa 60 μ crassitudine, spongiosa, hyphis verticalibus laxissime intertextis; latera stratumque basale, cellulis plus minusve isodiametricis, insuper in cortice mergentibus.

Apothecia ad 0.6 mm. diametro, circularia, applanata vel subdepressa, submarginata, sessilia vel in areolas assimilantes immersa, omnino areolas tegentia aut saepe annulum album equatorialem reliquentia, singula, nigra, carbonacea; cortex medullaque non evoluta; hypothecium hyalinum vel subbrunneum, 15–22 μ crassitudine, lateraliter tenuescens; thecium 50–70 μ altitudine; paraphyses 1–1.5 μ, apicibus 1.5–2.5 μ diametro, recti vel ramosi ad apices, epithecium 5–7 μ crassitudine, obscurum, KOH viridescens; asci 36–46 × 12–16.5 μ, obtuse clavati; ascosporae octonae, 9–12 × 5–7 μ, obscure brunneae, obtusae, uniseptatae, ad septum constrictae.

Thallus very small and firmly attached to rock; non-assimilative portion dull black, thinly effused, radiating in a stellate pattern from either assimilative areolae or apothecia, composed of simple strands of black cells, or in thicker better-developed areas with loose medullar cells in addition; assimilative areolae up to 0.33 mm., subhemispherical to elongate, flattened, usually single or two or three in a group, white or dingy, sides more or less blackened by the extension of the black cortical cells from the non-assimilative regions; upper cortex about 5 μ thick, sometimes of dark brown or black fastigiate cells, above which is frequently a layer of dead colorless cells; algal layer up to 40 μ thick, cells arranged in more or less spherical colonies, somewhat angular, 4–6 μ in diameter; medulla about 60 μ thick, spongy, of loosely woven hyphae predominantly vertical; sides and basal layer of dark more or less isodiametric cells merging into the fastigiate cortex above.

Apothecia up to 0.6 mm., circular in outline, flattened or slightly depressed with a slight rim, sessile upon or sunk in the assimilative areolae, usually covering them completely although often leaving an equatorial white rim, usually single, black, carbonaceous; cortex and medulla not developed; hypo-

thecium hyaline or faintly tinged with pale brown, 15–22 μ thick, thinning laterally; thecium 50–70 μ thick; paraphyses 1–1.5 μ in diameter, expanding to 1.5–2.5 μ at the tips, straight or rarely branched near the tips, the ends sometimes darkened by a heavier encrusting layer on the outer surfaces, epithecium 5–7 μ thick, dark, giving a faint greenish reaction with KOH; asci 36–46 × 12–16.5 μ, bluntly clavate, 8-spored; ascospores 9–12 × 5–7 μ, dark brown, two-celled, blunt, somewhat constricted at the septum.

On coarse-grained gray granite, granodiorite, sericite-orthoclase schist, biotite-sericite, and orthoclase-sericite-siderite schist.

MARIE BYRD LAND: Edsel Ford Range, Mt. Donald Woodward, *P. Siple, F. A. Wade, S. Corey & O. D. Stancliff DW-3*, type, *DW-5*; Haines Mts., *P. Siple & F. A. Wade H-2*; Mt. Rea-Cooper, *P. Siple, F. A. Wade, S. Corey & O. D. Stancliff R-7*; Chester Mts., *P. Siple & S. Corey 97A-4*; Lichen Peak, *P. Siple & S. Corey 73*.

BUELLIA **brunnescens** Dodge & Baker, sp. nov.

Pl. 56, figs. 312–315.

Type: Marie Byrd Land, Edsel Ford Range, Mt. Rea-Cooper, *P. Siple, F. A. Wade, S. Corey & O. D. Stancliff R-1*.

Thallus non assimilans tenuissimus, stellatus, niger vel obscure brunneus, cellulis internis verticalibus laxe implexis, exteris isodiametricis; areolae assimilantes ad 0.45 mm. diametro, ellipsoideae subphericaeve subapplanataeque, sparsae, olivaceo-brunneae vel sordidae vel etiam obscurissimae; cortex superior super stratum gonidiale hyalinus, strato singulo cellularum isodiametricarum, lateralis niger, uno vel pluribus stratis cellularum isodiametricarum; stratum gonidiale protococcoideum, ad 30 μ crassitudine, coloniis subsphericis et cellulis singulis; medulla 100–120 μ, irregulariter laxe contexta; stratum basale 20–30 μ crassitudine, obscurum, pseudoparenchymaticum.

Apothecia ad 0.33 mm., subspherica, applanata, sessilia, immersa, rare concava vel marginata, singula, nigra; cortex, medulla paratheciumque desunt; hypothecium 5–8 μ crassitudine, hyalinum vel subbrunneum; thecium 50–65 μ altitudine; paraphyses 1–1.5 μ, ramosi vel non ramosi, non inflati, apicibus callosis, epithecium circa 5 μ crassitudine; asci 43–48 × 12–14 μ, elongati, clavati, vaginati; ascosporae octonae, 9–9.5 × 5.5–6.5 μ, uniseptatae, subconstrictae, obtusae, obscuriores.

Thallus extremely delicate, of very fine straight threads spreading from assimilative areolae or apothecia, black or dark brown, not differentiated into cortex and medulla, the internal cells dark, in a more or less vertical, loosely woven tissue, the

outer cells pseudoparenchymatous; assimilative areolae up to 0.45 mm. in diameter, ellipsoidal or subspherical, pustular or more or less flattened, scattered, olive brown or dingy, sometimes very dark; cortex hyaline over algal zone, of one layer of pseudoparenchymatous cells, lateral cortex of one or more layers of pseudoparenchymatous cells; algal layer protococcoid, up to 30 μ thick, of subspherical colonies and single cells; medulla 100–120 μ, irregularly and loosely woven; basal layer 20–30 μ thick, of dark isodiametric cells.

Apothecia up to 0.33 mm., sessile to immersed, subspherical, flattened above, occasionally concave, marginate, mostly single, black; cortex, medulla, and parathecium not differentiated; hypothecium 5–8 μ thick, scant, hyaline or faintly brownish, not thinning; thecium 50–65 μ tall; paraphyses 1–1.5 μ at the tip, slender, scarcely inflated, branched or straight, tips with a small cap, epithecium about 5 μ thick; asci 43–48 × 12–14 μ, elongate-clavate with a prominent sheath, 8-spored; spores 9–9.5 × 5.5–6.5 μ, 2-celled, slightly constricted at the septum, rather blunt, dark.

On coarse-grained granite.

MARIE BYRD LAND: Edsel Ford Range, Mt. Rea-Cooper, *P. Siple, F. A. Wade, S. Corey & O. D. Stancliff R-1*, type, *R-2*.

BUELLIA **alboradians** Dodge & Baker, sp. nov.

Pl. 56, fig. 322; pl. 57, figs. 323–326.

Type: Marie Byrd Land, Edsel Ford Range, Haines Mts., *P. Siple & F. A. Wade H-1*.

Thallus stellatus, parvus, gregarius in areis ad 2 cm. diametro; areolae assimilantes ad 0.33 mm., albae, floccosae, diffractae, nigro-marginatae, angulares, irregulares, applanatae, parviores ad marginem thalli, ultimis in funiculos tenues reticulatos mergentibus; cortex superior 6–7 μ crassitudine, capitati-fastigiatus, cellulis sphericis, brunneis, 3–4 μ diametro, evanescens aut degenerans; stratum gonidiale 40–50 μ, coloniis sphericis ad 15 μ, sparsis, vaginatis, cellulis ad 7 μ; medulla hyphis laxe implicatis; stratum basale compactius, non bene evolutum, raro cellulis nigris sparsis.

Apothecia ad 0.5 mm., irregulariter hemispherica aut applanato-patellaeformia, raro concava, emarginata, nigra, sessilia, sparsa; cortex niger, ad 15 μ crassitudine, pseudoparenchymaticus; medulla paullum evoluta; hypothecium 40–60 μ, hyalinum aut subluteum, hyphis periclinalibus dense contextum, ad marginem tenuescens; paraphyses 1–3 μ, capitibus ad 5 μ diametro, ramosi, juniores non ramosi, apicibus

gelifactis, epithecium 8–15 μ crassitudine, obscurius; asci 36–50 × 13–18 μ, late clavati, vaginati; ascosporae octonae, 8–10(–12) × 4–6(–8) μ, uniseptatae, non constrictae.

Non-assimilative portions of thallus small black confervoid strands; assimilative areolae up to 0.33 mm., radiating in a stellate pattern over small areas of a few mm., or scattered, the entire area not exceeding 2 cm. in diameter, white, rather floccose, crackled, edged with black toward the base, the individual areolae angular, irregular, flattening and diminishing in size at the edges where the marginal segments pass into thin black strands, reticulate or trailing; upper cortex 6–7 μ thick, capitate-fastigiate, cells spherical, 3–4 μ in diameter, disappearing over the tops of the assimilative areolae; algal layer 40–50 μ, of spherical colonies up to 15 μ in diameter, sparingly scattered with broad strands of medullary tissue between, cells up to 7 μ in diameter, with broad sheaths; medulla of loosely woven hyphae; basal layer more compact but not differentiated, rarely with scattered black cells.

Apothecia up to 0.5 mm. in diameter, irregularly hemispheric or more flattened saucer-shaped, rarely concave, without a distinct rim, black, sessile, scattered; cortex black, up to 15 μ thick, pseudoparenchymatous; medulla slightly developed; parathecium not differentiated; hypothecium 40–60 μ thick, hyaline or faintly yellow, of densely woven periclinal hyphae thinning toward the margin; paraphyses 1–3 μ, expanding to heads up to 5 μ in diameter, branched, or unbranched especially when young, tips with thick gelified heads, darker at the outer edges, epithecium 8–15 μ thick; asci 36–50 × 13–18 μ, broadly clavate with a conspicuous sheath, 8-spored; ascospores 8–10(–12) × 4–6(–8) μ, 2-celled, only slightly if at all constricted at the septum, dark, one cell sometimes less blunt than the other, or sometimes non-septate although the spore is as large as the divided spores.

On sericite schist and sericite-orthoclase schist, brownish with iron.

MARIE BYRD LAND: Edsel Ford Range, Haines Mts., *P. Siple & F. A. Wade H-1*, type, *H-2*, *H-3*; Lichen Peak, *P. Siple & S. Corey 73-10*.

BUELLIA **Russellii** Dodge & Baker, sp. nov.

Pl. 60, figs. 370–375.

Type: South Victoria Land, Queen Maud Mts., Durham Mt. at northeast portal of Thorne Glacier, *Q. A. Blackburn, R. S. Russell Jr. & S. D. L. Paine QM-6(6).*

Thallus 1–2 cm. diametro, continuus, tenuis, gelifactus madefactus, granulosus vel subareolatus, albus; cortex deest, superficies paucis cellulis obscurioribus pachydermaticisque aut strato tenui 5–10 μ crassitudine cellularum emortuarum tectus; stratum gonidiale paucis coloniis in parte superiore thalli sparsis, cellulis ad 15 μ diametro; medulla ad 350 μ crassitudine, hyphis ad 4 μ diametro, ramosis, laxe reticulatimque dispositis; stratum basale non evolutum.

Apothecia 0.25 mm. diametro, sessilia, pauca, sparsa, convexa, emarginata, nigra, carbonacea; parathecium non evolutum; hypothecium circa 20 μ crassitudine, hyalinum, compactum; thecium 50–55 μ altitudine; paraphyses 1 μ diametro, capitibus brunneis, ad 4 μ diametro, ad apices ramosi, septati, vaginati, epithecium 5–8 μ, obscurum; asci 55–57 × 18–20 μ, elongati, clavati, maturitate latiores, vagina non prominens; ascosporae octonae, 16–20 × 5.5–7.0 μ, bicellulares, ad septa non constrictae, ellipsoideae vel naviculares vel subcurvatae, obscure brunneae, juventute duobus cellulis sporae isthmo angusto conjunctis.

Non-assimilative portions absent; assimilative portion 1–2 cm. in diameter, continuous, thin, gelified when moist, surface uneven, rather granulose to somewhat areolate, white; upper cortex lacking, the outer surface with occasional darker and heavier-walled cells or with a thin layer of dead cells, 5–10 μ thick; algal layer restricted to a few colonies in the upper parts of the thallus, cells up to 15 μ in diameter; medulla up to 350 μ thick, of freely branched hyphae 4 μ in diameter, loosely and reticulately arranged; lower cortex not differentiated, although the hyphae are sometimes more densely arranged in the surface regions as well as about the algae.

Apothecia small, up to 0.25 mm. in diameter, sessile, few, scattered, convex without a margin, black, carbonaceous; parathecium not differentiated; hypothecium about 20 μ thick, hyaline, not differentiated from the medulla beyond its greater compactness, laterally merging with the margin; thecium 50–55 μ high; paraphyses 1 μ in diameter, expanding to large dark brown heads 4 μ or more in diameter, freely branched near the tips, septate, with a gelified sheath, epithecium 5–8 μ, dark; asci 55–57 × 18–20 μ, 8-spored, elongate-clavate, more broadly so at maturity when distended by spores, sheath not especially

prominent, although appearing in younger stages than in other species; ascospores 16–20 × 5.5–7 μ, 2-celled, not constricted at the septum, ellipsoidal and navicular or slightly curved, dark brown. In young spores a narrow canal can often be seen connecting the two cells.

On white quartz crystals and dark brownish gray schist.

King Edward VII Land: Rockefeller Mts., Mt. Helen Washington, *P. Siple, F. A. Wade, S. Corey & O. D. Stancliff HW-11.*

South Victoria Land: Queen Maud Mts., Durham Mt. at northeast portal of Thorne Glacier, *Q. A. Blackburn, R. S. Russell Jr. & S. D. L. Paine QM-6(6)*, type.

Buellia **floccosa** Dodge & Baker, sp. nov.

Pl. 57, figs. 333–334; pl. 58, figs. 336–339.

Type: Marie Byrd Land, Haines Mts., *P. Siple & F. A. Wade H-2.*

Areolae assimilantes abundantes super areas ad 1.5 cm. diametro, appressae, albae vel cremeae, plus minusve floccosae, diffractae, irregulares, marginibus tenuescentibus, subfimbriatis; cortex 15 μ crassitudine, capitati-fastigiatus, cellulis sphericis pachydermaticis brunneis, mox evanescens; stratum gonidiale coloniis paucis sub cortice sparsis, ad 20 μ diametro, non continuum; medulla 100–200 μ crassitudine, funiculis tenuissimis verticalibus ramosisque; stratum basale non bene evolutum, cortici superiori subsimile.

Apothecia ad 0.3 mm. diametro, plerumque multo parviora, convexa vel subdepressa, raro marginata, circularia, applanata, sparsa vel singula, immersa, nigra; parathecium deest; hypothecium ad 45 μ crassitudine, ad marginem tenuescens, hyalinum, hyphis periclinalibus; thecium ad 40 μ; paraphyses 1 μ, capitibus 2–4 μ, ramosi, epithecum circa 8 μ, obscurum; asci 34–40 × 12.5–17 μ, clavati, vaginati; ascosporae 8–9.5 × 4.5–6 μ, octonae, uniseptatae raro non-septatae, subconstricti, obtusae, obscurae.

Non-assimilative portion not differentiated; assimilative areolae abundant over areas up to 1.5 cm., closely attached to the rock, pure white to cream color, more or less floccose, cracked, irregular, margin thinning out, becoming fimbriate in places; cortex 15 μ thick, capitate-fastigiate, of spherical thick-walled yellow-brown cells; algae protococcoid, in small colonies up to 20 μ in diameter just below the cortex, scant and scattered; medulla 100–200 μ thick, of extremely delicate strands of fine hyphae more or less vertical and branching; basal layer not well developed, similar to the upper cortex.

Apothecia up to 0.3 mm. in diameter but usually much smaller, convex to slightly depressed, occasionally with a mar-

gin, circular, scattered or single, immersed, dull to shiny; parathecium absent; hypothecium up to 45 μ thick in the center, thinning laterally and merging with the thalline cortex, hyaline, of deeply staining periclinal hyphae; thecium about 40 μ tall; paraphyses 1 μ in diameter, expanding to inflated tips 2–4 μ, usually repeatedly branched, rarely unbranched, epithecium about 8 μ thick, dark; asci 8-spored, 34–40 × 12.5–17 μ, clavate, with a gelified sheath; ascospores 8–9.5 × 4.5–6 μ, 2-celled, rarely undivided, slightly constricted, small, blunt and dark.

On sericite schist, brownish with iron.

MARIE BYRD LAND: Haines Mts., *P. Siple & F. A. Wade H-2*, type, *H-1*.

BUELLIA **dendritica** Dodge & Baker, sp. nov.

Pl. 59, figs. 358–362; pl. 60, figs. 363–364.

Type: King Edward VII Land, Rockefeller Mts., Mt. Helen Washington, *P. Siple, F. A. Wade, S. Corey & O. D. Stancliff HW-18.*

Thallus 5–8 mm. diametro; pars non assimilans ad 50 μ crassitudine, appressa, saxicola, plus minusve continua vel reticulata, marginibus fimbriatis vel dendriticis, nonnumquam paucis funiculis rugosis, nigris; cortex cellulis magnis nigris; medulla non bene evoluta, cellulis hyalinis; stratum basale a cortice non distinctum; areolae assimilantes ad 0.6 mm., circulares vel elongatae, obscure olivaceo-brunneae vel nigrae maturitate, dilutiores juventute, plus minusve pustulares, paucae, sparsae; cortex ad 12 μ crassitudine, cellulis fastigiatis, continuus insuper, cum strato cellularum emortuarum ad 15 μ crassitudine; algae protococcoideae, abundanter per areolas distributae; medulla 50 μ plusve crassitudine, hyphis magnis reticulatim implexis; stratum basale 10–15 μ, pseudoparenchymaticum, brunneum. Apothecia ad 0.33 mm. diametro, subspherica vel applanata, nonnumquam marginibus cellularum albidarum, singula, totam areolam tegentia, nigra, carbonacea; cortex 15 μ crassitudine, cellulis magnis pachydermaticis, cum cortice areolae continuus; hypothecium 20 μ crassitudine, non tenuescens, cellulis leptodermaticis compactum, hyalinum vel dilute brunneum; thecium ad 110 μ altitudine; paraphyses 1 μ, ramosi, capitibus 3 μ, epithecium 10 μ, rugosum, KOH virescens; asci 35–53 × 13–18 μ, elongati, clavati, breviores et crassiores maturitate; sporae octonae (raro senae, quaternae, vel binae, dein sporae majores), 8–10(–13) × 5–6(–7.5) μ, uniseptatae, subconstrictae, subacutae vel obtusae, brunneae.

Thallus covering areas 5–8 mm. in diameter, closely attached to the rock; non-assimilative areas 50 μ thick, more or less continuous but sometimes rather open-reticulate, margins fimbriate or dendritic, or sometimes of only a few rugose strands,

black; cortex of large dark cells a few rows in extent; medulla not differentiated morphologically but composed of a looser arrangement of hyaline cells; basal layer not distinct from the upper cortex; assimilative areolae up to 0.6 mm., circular to elongate, dark olive-brown to black at maturity, much lighter when young, more or less pustular, few and scattered; cortex up to 12 μ thick, well developed, of large fastigiate cells continuous over the top, the outer surface with an extensive layer of dead cells up to 15 μ thick; algae abundant, scattered throughout the areolae; medulla 50 μ or more thick, of coarse hyphae more or less reticulately woven; basal layer 10–15 μ thick, of compact brownish pseudoparenchyma.

Apothecia up to 0.33 mm. in diameter, small, subspherical to flattened, sometimes with a faint margin of whitish cells, usually single, covering the whole areola, black, carbonaceous; cortex 15 μ thick, of thick-walled dark cells continuous with the cortex of the areola; parathecium of a few cells merging with the cortex; hypothecium about 20 μ thick, an even layer not tapering, of closely united thin-walled cells, hyaline or faintly tinged brown; thecium up to 110 μ thick; paraphyses tapering from a little more than 1 μ to heads 3 μ or more, often much branched with heads in clusters, slightly darkened on the outer surfaces, epithecium about 10 μ thick, rugose, dark, giving a faint greenish reaction with KOH; asci 35–53 × 13–18 μ, elongate-clavate, becoming shorter and stouter at maturity when the spores distend them appreciably, 8-spored (but occasionally 6-, 4-, or 2-spored, with a corresponding increase in size of the ascospores); ascospores 2-celled, 8–10(–13) × 5–6(–7.5) μ, somewhat constricted at the septum, sometimes undivided, slightly pointed or blunt, dark brown.

On quartz crystals, leucogranite, granodiorite, biotite sericite, and dark greenish gray slate.

KING EDWARD VII LAND: Rockefeller Mts., Mt. Helen Washington, *P. Siple, F. A. Wade, S. Corey & O. D. Stancliff HW-18*, type, *HW-9, HW-11* (sterile.)

MARIE BYRD LAND: Edsel Ford Range, Mt. Rea-Cooper, *P. Siple, F. A. Wade, S. Corey & O. D. Stancliff R-1, R-2, R-7, R-26-27*; Skua Gull Peak, *P. Siple & S. Corey 72W-9, 72W-11, 72-16* (in close association with *Buellia albida*); Chester Mts., *P. Siple & S. Corey 97A-4*; Mt. Donald Woodward, *P. Siple, F. A. Wade, S. Corey & O. D. Stancliff DW-5.*

BUELLIA FRIGIDA Darbishire, Brit. Nat. Antarct. [Discovery] Exp. Nat. Hist. 5: Lichenes, 7. 1910.

Pl. 57, figs. 327–332, 335; pl. 65, fig. 427.

Illustrations: Darbishire, *Ibid. pl. 1, f. 4;* Brit. Antarct. [Terra Nova] Exp. Bot. 3: *pl. 1, f. 5, 6.*

Type: South Victoria Land, Granite Harbor, McMurdo Bay, *British National Antarctic [Discovery] Expedition.*

Thallus well developed, up to 7 cm. in diameter; non-assimilative portion black, carbonaceous, thick, overhanging at the margins, or the smaller parts thinning out, the whole forming a distinct zone 5–7.5 mm. wide, not differentiated into assimilative and non-assimilative portions, inside the black margin white flakes with a few black edges basally, more diffused centrally until often quite scattered, radiately cracked, the areolae irregular and angular; upper cortex 6–7 μ thick, capitate-fastigiate, but appearing as a single layer of dark thick-walled isodiametric cells, the hyphae bearing them thicker-walled but not otherwise differentiated from those of the algal and medullary layers; algal layer variable in thickness, protococcoid, cells small, 4–7 μ; medulla variable in thickness, of loosely woven thin-walled hyphae somewhat vertically arranged; basal layer brownish, about 15 μ, of compact dark brown, more or less isodiametric cells elongating upwards and merging with the medullary hyphae.

Apothecia carbonaceous, somewhat shiny, sessile or subsessile on the white assimilative areolae, flat to convex and almost spherical, up to 0.75 mm. in diameter, with or without a rim, sometimes with an equatorial white cortical remnant [those sectioned measure 120–205 μ tall and 410–650 μ in diameter]; cortex 15–17 μ thick, a palisade of isodiametric cells; medulla of vertical brown hyphae loosely woven and extending to the basal layer; parathecium not differentiated; hypothecium brown, 30–80 μ in the center, tapering to 2–8 μ at the margin and merging with the cortical cells, pseudoparenchymatous, with a tendency to periclinal arrangement; thecium 90–110 μ tall; paraphyses 50–60 × 2 μ, branched or unbranched, septate, when young scarcely expanded, when mature the walls thickened, expanding to a large apical head 4 μ in diameter,

darkened at the surface, tapering slightly below the head; asci short, bluntly clavate, with a well-developed sheath, 8-spored, 36–46 × 14.5–17 μ; ascospores dark, 2-celled, blunt, rarely or only slightly constricted, sometimes undivided, 9–13 × 5–8 μ.

On sericite-orthoclase schist and granodiorite.

MARIE BYRD LAND: Edsel Ford Range, Lichen Peak, *P. Siple & S. Corey 73-11*; Chester Mts., *P. Siple & S. Corey 97A-4.*

BUELLIA **albida** Dodge & Baker, sp. nov. Pl. 60, figs. 365–369.

Type: Marie Byrd Land, Edsel Ford Range, Skua Gull Peak, *P. Siple & S. Corey 72W-11,* growing with *Buellia dendritica.*

Pars non assimilans parva, funiculis tenuibus hypharum nigrarum, reticulata vel irregulariter radians, saxicola; cortex medullaque non evoluta; areolae assimilantes ad 0.67 mm. diametro, irregulares, applanatae vel pustulares, mollissimae madefactae, albidae, sparsae, non continuae; cortex non evolutus, amorphus; algae magnae, sparsae, non abundantes; medulla ad 75 μ crassitudine, laxissime implexa, circum algas bene evoluta; stratum basale ad 20 μ crassitudine, cellulis parvis brunneis compactum.

Apothecia ad 0.35 mm. diametro, subspherica, conica hemisphericave, sessilia, singula, totas areolas tegentia vel annulum cellularum corticalium emortuarum equatorialiter reliquentia, sparsa, singula raro plura in quaque areola, nigra; cortex paucis cellulis brunneis; hypothecium ad 45 μ crassitudine, tenuescens, obscure brunneum reticulatim subtus densius dispositis; thecium 35 μ altitudine; paraphyses 1.5 μ diametro, capitibus obscuris, ad 3 μ diametro, ramosi vel non ramosi, vaginati, epithecium ad 5 μ; asci 37–46(–49) × 13–16 μ, elongati, clavati, vaginati; ascosporae octonae, abnormaliter senae, quaternae vel binae, uniseptatae, subacutae, subconstrictae, brunneae, 11–14 × 5.5–7 μ.

Non-assimilative portion extremely scant, consisting of a few delicate strands of black hyphae, reticulate or irregularly radiating, usually scarcely discernible, covering areas of a few mm. on the rock; no morphological differentiation of cortex and medulla; assimilative areolae up to 0.67 mm. in diameter, irregular in outline, flat to pustular, extremely soft when moistened, whitish, scattered, not continuous; cortex not distinct, almost amorphous; medulla up to 75 μ thick, very loose, best developed around the algae which are large but not abundant, near the outer surfaces; basal layer up to 20 μ thick, of dark small cells compactly arranged.

Apothecia up to 0.35 mm. in diameter, subspherical to conical or hemispherical, sessile upon the areolae, a single one fre-

quently covering the entire areola or leaving only a whitish equatorial zone of dead cortical cells, scattered, usually one per areola, sometimes more, black; parathecium scarcely differentiated, consisting of a few cells merging laterally with the cortex which consists of a few scattered dark cells at the margin; hypothecium up to 45 μ at the center, diminishing laterally to only a few cells at the margin, dark brown, of more or less reticulate cells, denser at the base than just below the thecium; thecium about 35 μ thick; paraphyses 1.5 μ wide, expanding to the darkened heads up to 3 μ in diameter, branched or unbranched, sheath prominent, epithecium about 5 μ, dark; asci 37–46(–49) × 13–16 μ, elongate, clavate, sheath at the apex especially prominent, usually 8-spored, abnormally with 6, 4, or 2 spores, the spores correspondingly larger; ascospores 11–14 × 5.5–7 μ, 2-celled, ends slightly pointed, slightly constricted at the septum, dark.

Growing with *Buellia dendritica* on sericite-orthoclase schist and on sandy loam.

MARIE BYRD LAND: Edsel Ford Range, Skua Gull Peak, *P. Siple & S. Corey 72W-10, 72W-11*, type; Mt. Stancliff, *P. Siple & S. Corey 72A-1;* Lichen Peak, *P. Siple & S. Corey 73-1.*

RINODINA

RINODINA S. F. Gray, Nat. Arr. Brit. Pl. **1**: 448. 1821. (pr. p. min.); Massalongo, Ricerche Auton. Lich. 14. 1852.

Lecanora subg. *Rinodina* Ach., Syn. Lich. 146. 1814.

Dimelaena Norm., Nyt Mag. Naturvidensk. **7**: 231. 1853 (pr. p. min.).

Berengeria Trevisan, Riv. Period. Lav. Accad. Padova, 265. 1851-2.

Pleorinis Clements, Gen. Fung. 84. 1909.

Merorinis Clements, Gen. Fung. 84. 1909.

Dictyorinis Clements, Gen. Fung. 84. 1909.

The type species was not designated. Of Gray's species all but three, *R. exigua, R. periclea,* and *R. sophodes,* have been transferred elsewhere. Acharius had included *R. periclea* and *R. sophodes* in his subgenus. When Massalongo gave the genus its present definition, he described two new species and

included *R. oreina* and *R. sophodes* from Archarius' subgenus. Since *R. oreina* is the type of *Beltraminia,* and since *R. sophodes* is the only species common to all three treatments, the latter may be taken as the type. Thus it will conserve the name in the sense it has been almost universally used since it was redefined by Massalongo. *Dimelaena* Norm. was based on six species now included in *Physcia* and on four species in *Rinodina.* As it is antedated by either genus, a consideration of its type species is relatively unimportant. *Berengeria* was proposed shortly after *Rinodina* was redefined by Massalongo, and contains all the species proposed by Massalongo, including his new ones, with some others. It was early abandoned as a synonym of *Rinodina. Pleorinis* was based on *R. polyspora* Th. Fr. *Merorinis* was based on *R. Conradi* Koerb. and is available if the subsection *Conradia* is raised to generic rank. *Dictyorinis* was based on *R. diplinthia* Nyl. for the species of *R. Eurinodina* subsect. *Conradia* with muriform spores.

Thallus crustose, rarely squamulose, uniform or with an effigurate margin (in *Beltraminia),* attached to the substrate by hyphae of the prothallus or of the medulla, without rhizinae; ecorticate, or with a fastigiate cortex, or in the higher forms with a palisade of pseudoparenchyma; algae protococcoid; medulla of loosely woven thin-walled hyphae. Apothecia circular, immersed or sessile, lecanorine, but in some species with the algae early disappearing from the amphithecium; parathecium thin or absent; epithecium dark or black, horny or pulverulent, usually colored purple or violet with KOH; hypothecium hyaline, rarely dark; paraphyses filiform, seldom forked, more or less gelified, usually capitate; asci normally 8-spored, exceptionally up to 24 spores; spores smoke gray, brown, or black, 2–4-celled, wall very thick, commonly united by an isthmus. Spermogonia immersed or in warts, irregularly flask-shaped; spermatia small, elongate, straight.

Malme (Bih. K. Svensk. Vetensk. Akad. Handl. III. 28^1: 7-15. 1902) divided the genus into four sections and subdivided the section *Eurinodina* into two subsections (for characters see p. 631). Vainio (Ark. f. Bot. 8^4: 76–82. 1909) proposed

Melanaspicilia for species with immersed apothecia which Zahlbruckner has placed in *Eurinodina.* This entity seems worthy of recognition as another section at least. Several of the other sections have also been described as genera. A monograph of the genus is badly needed. Two species from the Antarctic Archipelago belong in *Beltraminia,* three in *Melanaspicilia,* and two besides our two from Marie Byrd Land and King Edward VII Land belong to *Eurinodina,* subsect. *Pachysporaria.*

KEY TO ANTARCTIC SPECIES

Thallus effigurate; spore walls thin, not polaribilocular.............. BELTRAMINIA
- Spores 18–20 × 8–10 μ; apothecia 0.25 mm.; thallus 3 mm. thick...... *R. crassa*
- Spores 14–17 × 6.5–9 μ; apothecia 0.5–1.3 mm.; thallus 0.5–0.6 mm.. *R. Petermanni*

Thallus uniform; spores 2-celled.
- Apothecia immersed; hypothecium fuscous.................. MELANASPICILIA
  - Parathecium not developed; thallus KOH–.................. *R. hypopoichila*
  - Parathecium hyaline.
    - Cortex 15–20 μ, KOH yellow, rarely reddening in the center.... *R. ditissima*
    - Cortex 20–40 μ, KOH red.............................. *R. erythrodia*
- Apothecia sessile.......................... EURINODINA subsect. PACHYSPORARIA
  - Spores 11–13.5 × 6–8 μ; apothecia 1.35 mm..................... *R. sordida*
  - Spores 20–28 × 8–13 μ.
    - Cortex 30–40 μ; apothecia 1.20 μ; paraphyses 1 μ in diameter... *R. olivaceobrunnea*
    - Cortex 10 μ; apothecia 0.2–0.6 μ; paraphyses 3 μ............ *R. egentissima*
  - Spores 28–34 × 12–14 μ....................................... *R. turfacea*

RINODINA **sordida** Dodge & Baker, sp. nov.

Pl. 61, figs. 387–392.

Type: Marie Byrd Land, Edsel Ford Range, Skua Gull Peak, *P. Siple & S. Corey 72W-6.*

Thallus ad 3 cm. diametro; pars non assimilans parva, nigra; cortex capitato-fastigiatus, cellulis brunneis pachydermaticis; medulla non bene evoluta, cellulis hyalinis vel pallide brunneis; stratum basale cortici simile; areolae assimilantes ad 1 mm. diametro, angulares, diffractae, continuae, albae vel sordide griseae, marginibus nigris; cortex fastigiatus, lateribus bene evolutus, saepe cum strato conspicuo cellularum emortuarum tectus; stratum gonidiale non bene evolutum, algis in dimidio superiore sparsis; algae ad 18 μ diametro, protococcoideae; medulla hyphis laxe contexta; stratum basale cellularum parvarum obscurarum.

Apothecia ad 1.35 mm. diametro, angularia, sinuosa vel hemispherica, convexa, applanata, marginata vel concava, superficie nonnumquam diffracta, sparsa vel conferta, in areolis sessilia; amphithecium 100 μ crassitudine; cortex 20 μ, cellulis

sphericis subhyalinis; stratum gonidiale cellulis 4–5 μ diametro, sparsis; medulla deest; hypothecium ad 230 μ crassitudine, ad marginem tenuescens, hyalinum, cellulis minutis compactum; parathecium deest; thecium ad 70 μ altum; paraphyses 1 μ, apicibus 2–5 μ diametro, ramosi sub apicibus vel non ramosi, septati, pachydermatici; asci 47–54–63 × 16–19 μ, clavati, vaginati, maturitate breviores; sporae octonae, 11–13.5 × 6–8 μ, uniseptatae, subconstrictae, obtusae acutaeve, brunneae.

Thallus up to 3 cm. in diameter; non-assimilative portion scant, black, dull; cortex capitate-fastigiate, cells brown and thick-walled; medulla not differentiated morphologically, cells hyaline to pale brown; basal layer similar to the cortex; assimilative areolae up to 1 mm. in diameter, angular by deep cracks, continuous, white to dark gray, the margins frequently blackened; cortex fastigiate, well developed laterally and in places over the upper surface, often with a conspicuous zone of dead cortical cells; algal layer not well differentiated, cells scattered in the upper half of the thallus; algae up to 18 μ in diameter, protococcoid; medulla of loosely woven hyphae; basal layer of dark, small, closely united cells merging laterally with the fastigiate cortex.

Apothecia up to 1.35 mm. in diameter, angular, sinuous or hemispherical, convex, flattened with a faint margin or umbilicate, surface cracked, scattered or closely gregarious, sessile on the areolae; amphithecium 100 μ thick; cortex 20 μ thick, of spherical subhyaline cells; gonidial layer of scattered cells 4–5 μ in diameter; no medulla or parathecium; hypothecium up to 230 μ thick, thinning toward the margin, hyaline, compact, of small cells; thecium up to 70 μ thick; paraphyses 1 μ expanding to apices 2–5 μ, branched or unbranched, conspicuously septate, thick-walled, the outer surfaces of the heads with a prominent dark cap, often much branched near the top forming short clusters of branches each a few cells long; asci 8-spored, 47–54–63 × 16–19 μ, slender, clavate with a well developed gelified sheath, the mature asci shorter and stouter as the spores fill the sac; ascospores 11–13.5 × 6–8 μ, 2-celled, slightly constricted at the septum, blunt or pointed, dark brown.

On orthoclase-sericite-siderite schist.

MARIE BYRD LAND: Edsel Ford Range, Skua Gull Peak, *P. Siple & S. Corey 72W-6*, type, *72W-13*.

RINODINA **olivaceobrunnea** Dodge & Baker, sp. nov.
Pl. 61, figs. 381–386.

Type: Marie Byrd Land, Edsel Ford Range, Skua Gull Peak, *P. Siple & S. Corey 72W-13.*

Thallus olivaceo-brunneus, gelifactus, mollis; cortex 30–40 μ, pseudoparenchymaticus, paullo obscurus, cum strato cellularum corticalium emortuarum tectus; medulla hyphis reticulatim implexis; stratum basale cortici simile, nonnumquam obscurius, raro attenuatum, in funiculis subrhizoideis.

Apothecia ad 1.20 mm. diametro, irregularia, angularia vel circularia, applanata, marginibus crenulatis, disco nigro, excipulo pallide olivaceo, subsessilia; cortex continuus cum ei thalli; stratum gonidiale 55–60 μ crassitudine, ad 40 μ sub hypothecio tenuescens, cellulis 10–12 μ, sine vaginis; parathecium 20–25 μ crassitudine, hyalinum, continuum cum hypothecio, non cum cortice mergens; hypothecium 20–30 μ crassitudine, hyalinum, pseudoparenchymaticum; thecium 100–120 μ altitudine; paraphyses 1 μ diametro, capitibus pallide brunneis, 2–3 μ, ramosi, vagina non prominente, epithecium circa 10 μ crassitudine, pallide brunneum, gelifactum; asci 70–92 × 16–28 μ, elongato-clavati, apicibus vaginatis; ascosporae octonae, 22–28 × 10–13 μ, uniseptatae, raro polaribiloculares septoque constrictae, obscure brunneae.

Assimilative portion of thallus spreading among loose gravel and mosses, not conspicuous, olive brown to black, rather gelified, soft; cortex 30–40 μ, fastigiate, pseudoparenchymatous, outer cells slightly darkened, frequently with a thick layer of dead cortical cells covering the outside; medulla of loosely and reticulately woven hyphae; basal layer similar to the cortex, occasionally darker or attenuated into almost rhizoidal strands of attachment.

Apothecia up to 1.20 mm. in diameter, irregular in shape, angular to circular, flattened, with a distinct, often somewhat crenulate margin, disc black with a white to pale olive exciple, subsessile; cortex continuous with that of the thallus and of the same structure; algal layer protococcoid, 55–60 μ, thinning to 40 μ under the hypothecium, cells 10–12 μ, without the thick sheaths; parathecium 20–25 μ thick, continuous from the hypothecium, not merging with the cortex; hypothecium 20–30 μ thick, dark, pseudoparenchymatous; thecium 100–120 μ tall; paraphyses 1 μ in diameter expanding to pale brown heads 2–3 μ in diameter, mostly branched, the outer surfaces of the heads with a narrow darkened rim, sheath not prominent, epithecium about 10 μ thick, pale brown, gelified; asci 70–92 ×

16–28 μ, 8-spored, broadening at maturity but elongate-clavate when young with a very prominent gelified sheath at the tips; ascospores 22–28 × 10–13 μ, 2-celled, sometimes connected by a canal, rarely constricted at the septum, dark brown.

Growing over mosses and gravel from coarse-grained pink granite.

In the younger areolae, the upper cortex consists of 3-6 layers of isodiametric cells.

KING EDWARD VII LAND: Rockefeller Mts., Mt. Helen Washington, *P. Siple, F. A. Wade, S. Corey & O. D. Stancliff HW-2, HW-6, HW-9, HW-12, HW-13, HW-18.*

MARIE BYRD LAND: Edsel Ford Range, Mt. Rea-Cooper, *P. Siple, F. A. Wade, S. Corey & O. D. Stancliff R-2, R-4;* Skua Gull Peak, *P. Siple & S. Corey 72W-13*, type.

PHYSCIACEAE

Thallus foliose, repeatedly lobed, more rarely subfruticose, usually attached to the substrate by rhizinae, heteromerous, dorsiventral or radiate; corticate; with *Protococcus* algae. Apothecia circular, sessile, lecideine or lecanorine; paraphyses simple; asci 8-spored; ascospores brown, 2-celled, rarely 4-celled, or by the formation of a few vertical septa, few-celled muriform with a thickened spore wall. Spermatia short, straight.

Only sterile specimens referred to *Physcia* have been found in the Antarctic.

PHYSCIA

PHYSCIA (Schreber) Hampe ap. Furnrohr, Naturh. Topogr. Regensburg **2**: 249. 1839.

Lichen subgen. *Physcia* Schreber in Linné, Gen. Pl. ed. 8. 768. 1791.

The nomenclatorial history of *Physcia* and the correct application of the name is difficult to trace as we have not had access to all the pertinent literature. In the first half of the nineteenth century the name was applied to various groups of Parmeliaceae, Teloschistaceae, and Physciaceae. From the synonymy listed in Zahlbruckner, Cat. Lich. Univ. **7**: 577–704. 1931, apparently the first combination of a species in the genus as now recognized was *P. hispida* (Hoffm.) Frege, Deutsch. Bot. Taschenbuch **2**: 169. 1812. Hampe (ap. Furnrohr, Naturh.

Topogr. Regensburg **2**: 249–250. 1839) added four species at present recognized in this genus. By 1860 Nylander and Th. M. Fries described the genus in its present sense except for more recent segregates. From such data as are available, the type species appears to be *P. pulverulenta* (Schreber) Hampe, the only species of this genus described by Schreber, or *P. hispida* (Hoffm.) Frege. Either of these species would conserve the name in the sense current among modern lichenologists.

Thallus foliose, appressed or ascending, usually attached to the substrate by rhizinae, repeatedly lobed, laciniae mostly slender; upper cortex a palisade of hyphae forming a pseudoparenchyma; lower cortex of periclinal hyphae not greatly differentiated from the medulla (fastigiate in *P. fuscella* from Antarctica); algae *Protococcus;* medulla arachnoid, of thin-walled periclinal hyphae; apothecia circular, sessile, lecanorine, disc brown to black, nude or pruinose; paraphyses simple, usually septate; epithecium not colored by KOH; hypothecium hyaline or dark; asci 8-spored; ascospores brown, elongate to ellipsoidal, usually 2-celled, rarely 4-celled or few-celled muriform, wall thickened; spermogonia immersed or slightly protruding; spermatia elongate to long-cylindric, straight, or in a few species filiform and curved.

The sections are separated as follows:

Hypothecium black; spores 2-celled; tropical and subtropical........... DIRINARIA
Hypothecium hyaline.
  Spores 2-celled .... EUPHYSCIA
  Spores few-celled muriform; New Zealand..................... HYPERPHYSCIA

For key to Antarctic species see p. 584.

LICHEN PARASITES

Besides the possible parasites described on p. 525 as *Thelidium Caloplacae* and *T. parvum,* the following species has been found on *Parmelia.*

DIPLONAEVIA **Parmeliae** Dodge & Baker, sp. nov.

Pl. 62, figs. 396–400.

Type: Marie Byrd Land, Edsel Ford Range, Skua Gull Peak, *P. Siple & S. Corey 72W-3.*

Apothecia ad 150 μ diametro, fusca nigrave, convexa, emarginata; parathecium 10–15 μ crassitudine, pseudoparenchymaticum, obscurum; hypothecium 20 μ crassitudine, brunneum, hyphis dense irregulariter intertextis; medulla dilutior, cellulis brevibus irregularibus, 2 × 4 μ; thecium 30–35 μ altitudine; paraphyses 1 × 1.5 μ, recti, septati, apicibus expansis obscuris ramosis, epithecium 10–15 μ, obscurum, rugosum; asci 21–24 × 8–10 μ, breviter clavati, vagina tenui; ascosporae 7–8 × 2–2.5 μ, octonae, hyalinae, vaginatae.

Apothecia up to 150 μ in diameter, fuscous to black, convex, emarginate; parathecium 10–15 μ thick, pseudoparenchymatous, dark; hypothecium about 20 μ thick, brownish, of irregularly and densely interwoven hyphae; medulla of the same texture, lighter, of short irregular cells 2 × 4 μ, ending irregularly in the host tissue; thecium 30–35 μ tall; paraphyses 1–1.5 μ, straight, septate, the tips slightly enlarged, darkened, possibly branched; epithecium 10–15 μ thick, dark, rugose, continuous with the parathecium; asci 21–24 × 8–10 μ, short-clavate with a thin sheath, 8-spored, ascospores 7–8 × 2–2.5 μ, apparently 2-celled, one end slightly pointed, the other more blunt, hyaline with a faint halo.

Parasitic on *Parmelia variolosa* Dodge & Baker.

MARIE BYRD LAND: Edsel Ford Range, Skua Gull Peak, *P. Siple & S. Corey 72W-3.*

Explanation of Plate

PLATE 38

All figures except the habit sketches were drawn with the aid of an Abbé camera lucida. Magnifications are given for each figure.

Figs. 1–5. *Thelidium inaequale.*

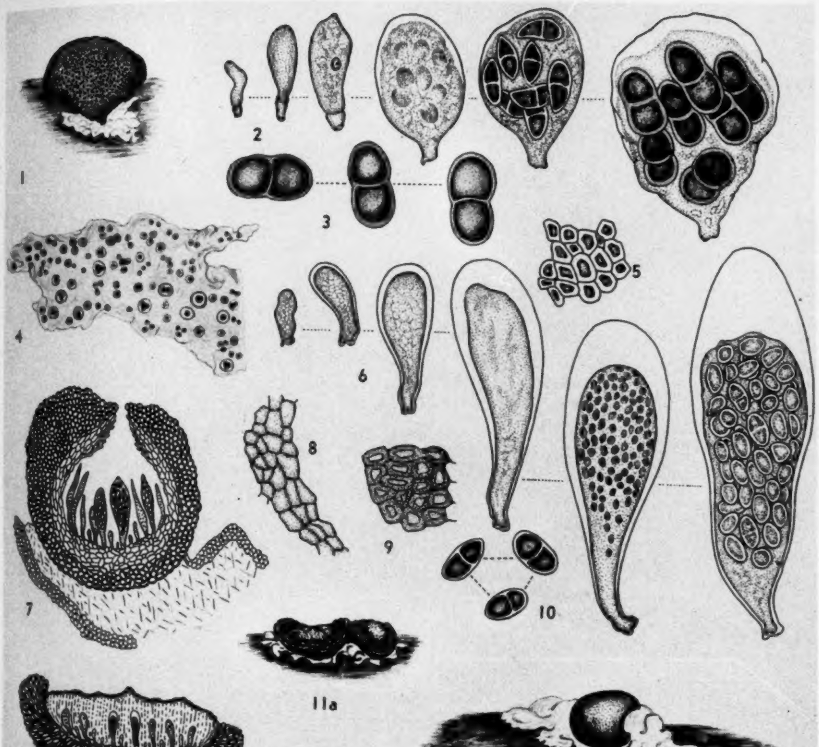
Fig. 1. Habit sketch of perithecium and thallus. × 104.
Fig. 2. Development of ascus through maturity. × 1100.
Fig. 3. Mature spores. × 1100.
Fig. 4. Detail of gelatinous, non-cellular thallus. × 434.
Fig. 5. External view of the apothecial wall cells. × 434.

Figs. 6–10. *Thelidium Caloplacae.*

Fig. 6. Development of ascus through maturity. × 1100.
Fig. 7. Section of perithecium and host. × 218.
Fig. 8. Detail of cells from inner wall of perithecium. × 1100.
Fig. 9. Detail of cells from outer wall layers of the perithecium. × 1100.
Fig. 10. Mature spores. × 1100.

Figs. 11–17. *Lecidea capsulata.*

Fig. 11a. Habit sketch, apothecia with marginal rims; from Mt. Rea. × 65.
Fig. 11b. Habit sketch, apothecia without marginal rims; from Mt. Donald Woodward. × 65.
Fig. 12a. Section through apothecium. × 1100.
Fig. 12b. Section through thallus. × 1100.
Fig. 13. Development of ascus through maturity. × 1100.
Fig. 14. Paraphyses. × 1100.
Fig. 15. Detail of cells from the hypothecium. × 1100.
Fig. 16. Mature spores from various collections showing variation in size and shape. × 1100.
Fig. 17. Hyphae from the thallus medulla. × 1100.



SECOND BYRD ANTARCTIC EXPEDITION

Explanation of Plate

PLATE 39

Figs. 18–21. *Lecidea Wadei.*

Fig. 18. Section through apothecium and thallus, showing amorphous basal region with clumps of bacteria. × 104.

Fig. 19. Development of ascus through maturity. × 1100.

Fig. 20. Paraphysis. × 1100.

Fig. 21. Mature spores. × 1100.

Figs. 22–28. *Lecidea Siplei.*

Fig. 22. Habit sketch of thallus and apothecia. × 20.

Fig. 23. Paraphyses. × 1100.

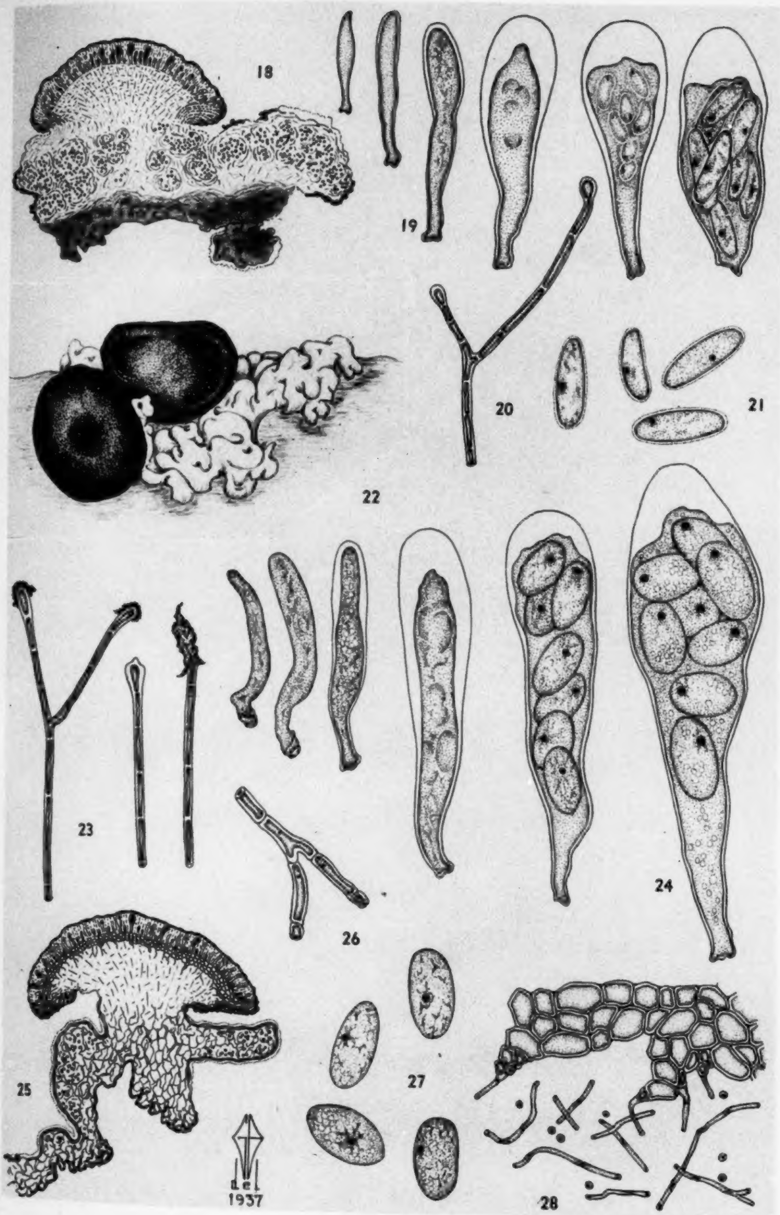
Fig. 24. Development of ascus through maturity. × 1100.

Fig. 25. Section through apothecium and thallus. × 35.

Fig. 26. Hyphae from the reticulate medulla of the thallus. × 1100.

Fig. 27. Mature spores. × 1100.

Fig. 28. Detail of cells from the hypothecium and adjoining filamentous medulla. × 1100.

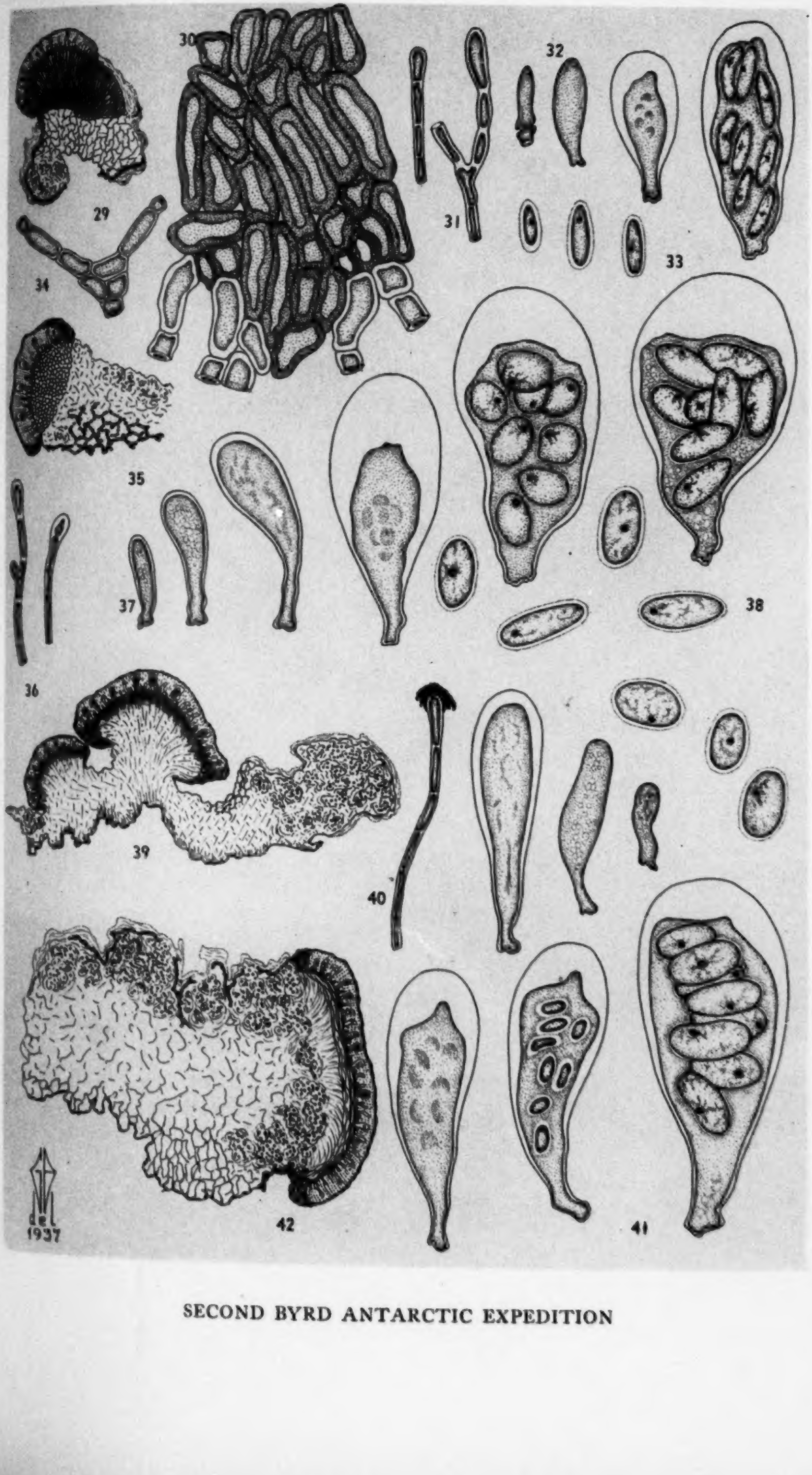


SECOND BYRD ANTARCTIC EXPEDITION

EXPLANATION OF PLATE

PLATE 40

Figs. 29–34. *Lecidea Coreyi.*
Fig. 29. Section through apothecium and thallus. × 55.
Fig. 30. Detail of hypothecial cells and adjacent medulla with thinner-walled cells. × 1100.
Fig. 31. Paraphyses. × 1100.
Fig. 32. Development of ascus through maturity. × 1100.
Fig. 33. Mature spores. × 1100.
Fig. 34. Detail of medullar hyphae. × 1100.
Figs. 35–38. *Lecidea ecorticata.*
Fig. 35. Section through apothecium and thallus. × 55.
Fig. 36. Paraphyses. × 1100.
Fig. 37. Development of ascus through maturity. × 1100.
Fig. 38. Spores, showing variation in size and shape. × 1100.
Figs. 39–41. *Lecidea Byrdii.*
Fig. 39. Section through apothecium and thallus. × 55.
Fig. 40. Paraphysis, the head unusually expanded. × 1100.
Fig. 41. Development of ascus through maturity. × 1100.
Fig. 41a. Mature spores. × 1100.
Fig. 42. *Lecidea Stancliffi.* Section through apothecium and thallus. × 55.

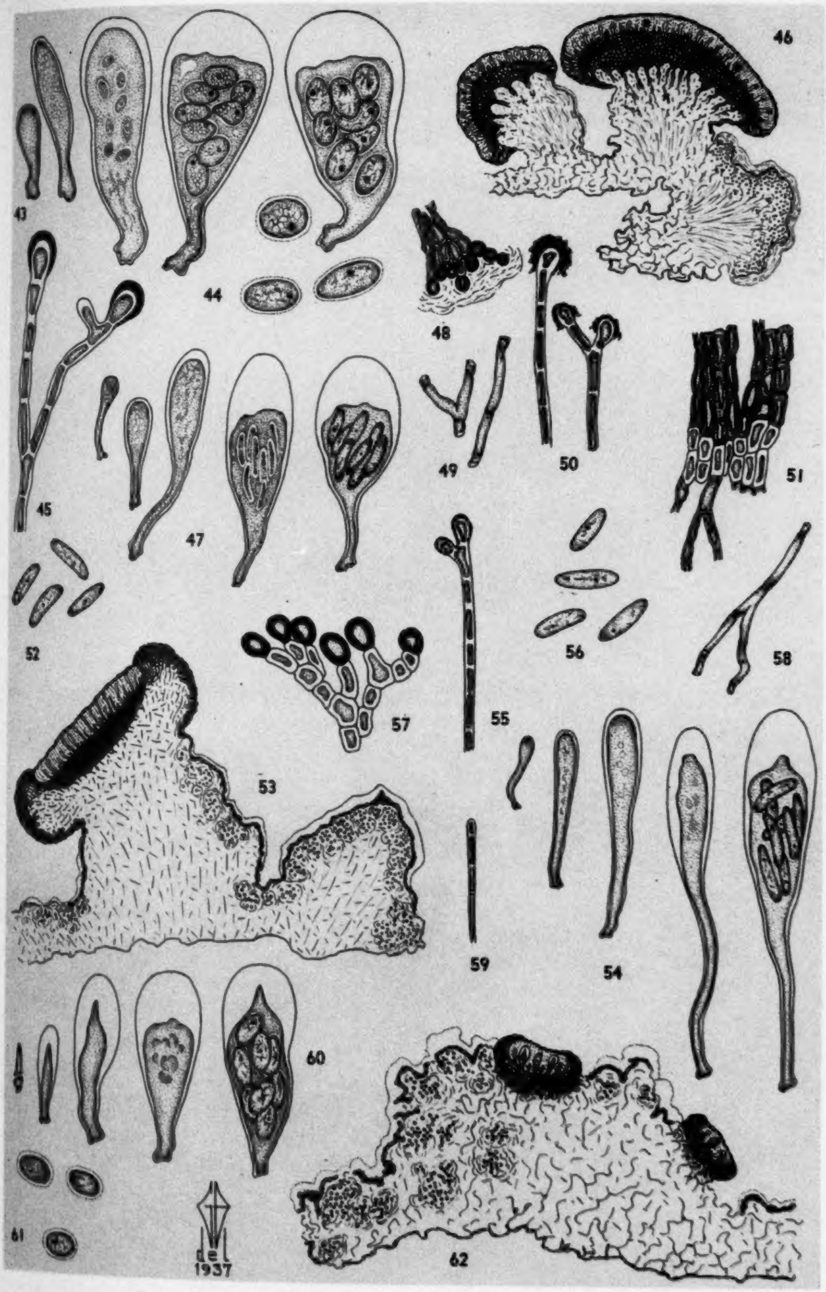


SECOND BYRD ANTARCTIC EXPEDITION

Explanation of Plate

PLATE 41

Figs. 43–45. *Lecidea Stancliffi.*
Fig. 43. Development of ascus through maturity. × 1100.
Fig. 44. Mature spores. × 1100.
Fig. 45. Paraphysis. × 1100.
Figs. 46–52. *Lecidea canriformis.*
Fig. 46. Section through apothecia and thallus. × 35.
Fig. 47. Development of ascus through maturity. × 1100.
Fig. 48. Detail of cortex of the thallus. × 1100.
Fig. 49. Medullar hyphae from the thallus. × 1100.
Fig. 50. Paraphyses. × 1100.
Fig. 51. Detail of hypothecium. × 1100.
Fig. 52. Mature spores. × 1100.
Figs. 53–56. *Lecidea Blackburni.*
Fig. 53. Section of apothecium and thallus. × 55.
Fig. 54. Development of ascus through maturity. × 1100.
Fig. 55. Paraphysis. × 1100.
Fig. 56. Mature spores. × 1100.
Figs. 57–62. *Lecidea Painei.*
Fig. 57. Detail of cortex and subcortical thalline tissues. × 1100.
Fig. 58. Detail of medullar hyphae. × 1100.
Fig. 59. Paraphysis. × 1100.
Fig. 60. Development of ascus through maturity. × 1100.
Fig. 61. Mature spores. × 1100.
Fig. 62. Section through thallus and apothecia. × 55.

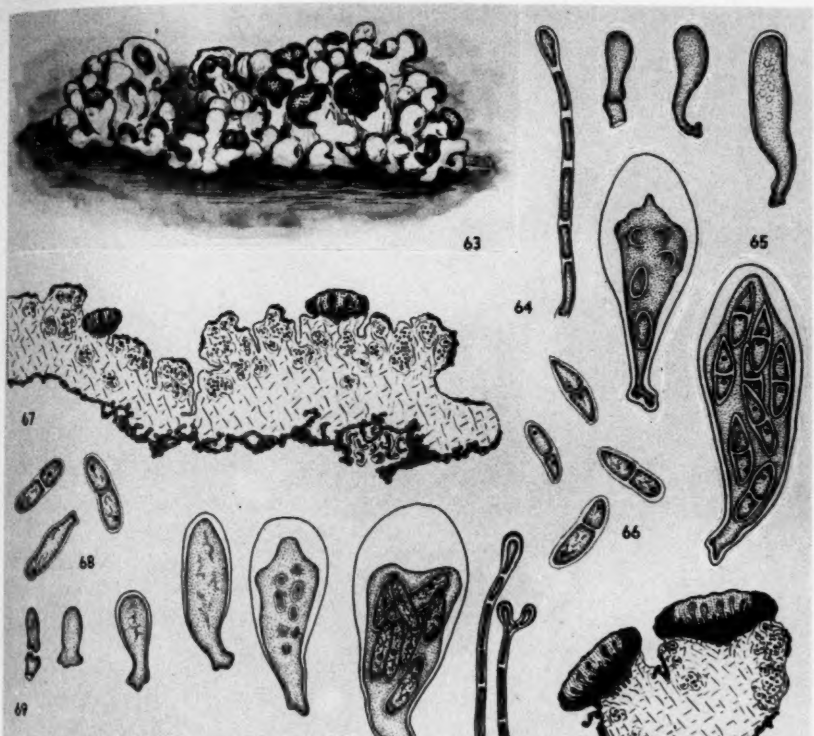


SECOND BYRD ANTARCTIC EXPEDITION

Explanation of Plate

PLATE 42

Figs. 63–67. *Catillaria floccosa.*
Fig. 63. Habit sketch showing thallus and apothecia. × 24.
Fig. 64. Paraphysis. × 1100.
Fig. 65. Development of ascus through maturity. × 1100.
Fig. 66. Mature spores. × 1100.
Fig. 67. Section through apothecia and thallus. × 55.
Figs. 68–71. *Catillaria cremea.*
Fig. 68. Mature spores. × 1100.
Fig. 69. Development of ascus through maturity. × 1100.
Fig. 70. Section of apothecia and thallus. × 55.
Fig. 71. Paraphyses. × 1100.
Figs. 72–77. *Catillaria arachnoidea.*
Fig. 72. Section of apothecia and thallus. × 55.
Fig. 73. Paraphysis. × 1100.
Fig. 74. Development of ascus through maturity. × 1100.
Fig. 75. Detail of parathecium. × 1100.
Fig. 76a. Detail of hyphae from sub-apothecial region. × 1100.
Fig. 76b. Detail of hyphae from the medulla proper. × 1100.
Fig. 77. Mature spores. × 1100.



SECOND BYRD ANTARCTIC EXPEDITION

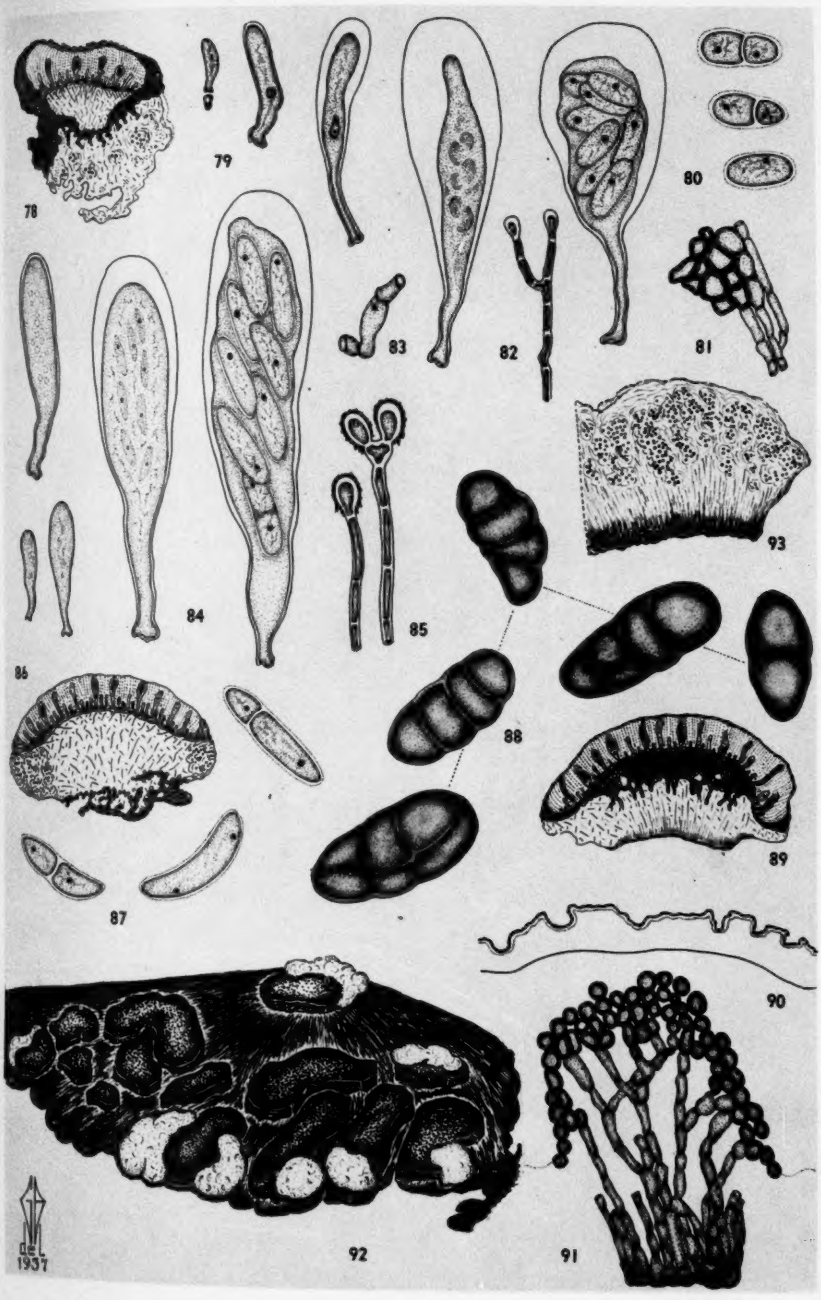
EXPLANATION OF PLATE

PLATE 43

Figs. 78–83. *Catillaria granulosa.*
Fig. 78. Section through apothecium and thallus. × 104.
Fig. 79. Development of ascus through maturity. × 1100.
Fig. 80. Spores in varying degrees of maturity. × 1100.
Fig. 81. Detail of cells from the region adjacent to the thecium. × 1100.
Fig. 82. Paraphysis. × 1100.
Fig. 83. Medullar hypha. × 1100.

Figs. 84–87. *Catillaria inconspicua.*
Fig. 84. Development of ascus through maturity. × 1100.
Fig. 85. Paraphyses. × 1100.
Fig. 86. Section through apothecium and thallus. × 55.
Fig. 87. Spores in varying degrees of maturity. × 1100.

Figs. 88–93. *Rhizocarpon flavum.*
Fig. 88. Spores from different sources and showing variation in size and shape. × 1100.
Fig. 89. Section through an apothecium. × 35.
Fig. 90. Section through non-assimilative areola. × 104.
Fig. 91. Detail of non-assimilative areola from base to upper surface. × 434.
Fig. 92. Habit sketch showing non-assimilative areas, assimilative areolae, and apothecia. × 17.
Fig. 93. Section through an assimilative areola. × 35.



SECOND BYRD ANTARCTIC EXPEDITION

EXPLANATION OF PLATE

PLATE 44

Figs. 94–97. ***Rhizocarpon flavum.***

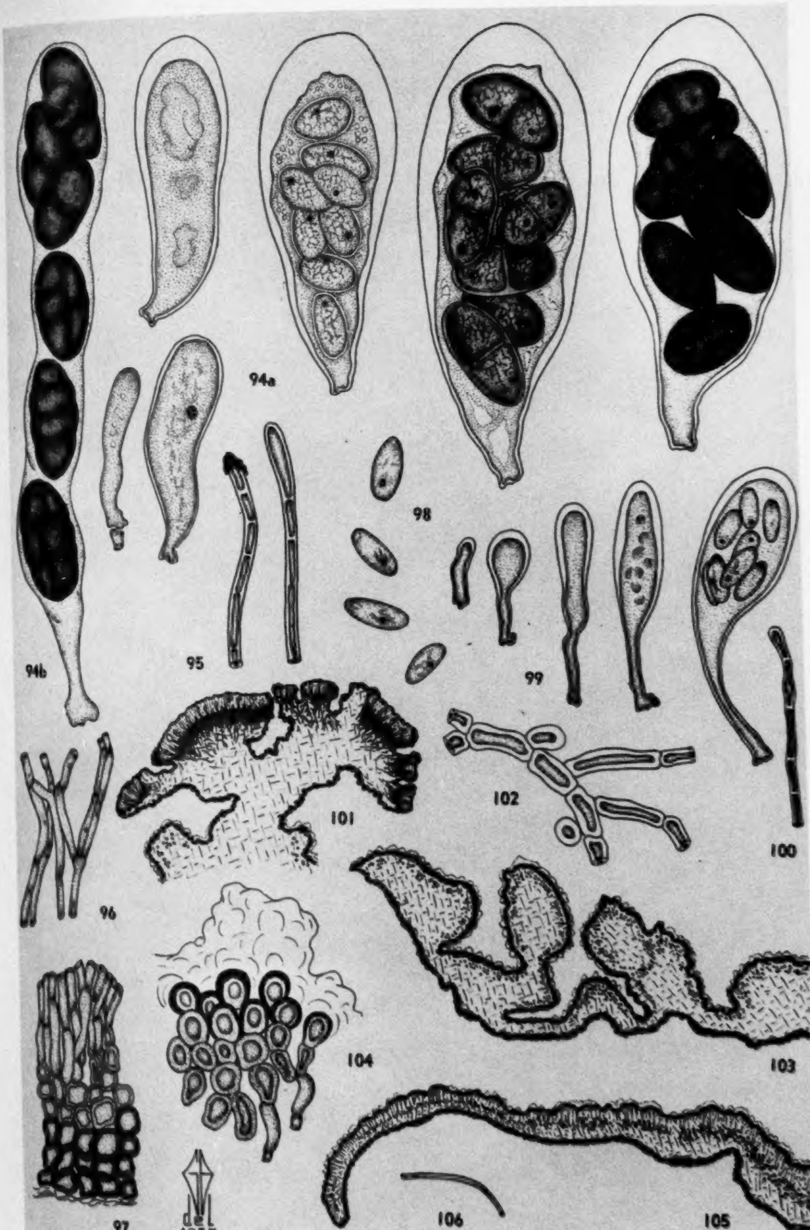
Fig. 94a. Development of ascus through maturity. × 1100.
Fig. 94b. Extremely attenuated ascus. × 1100.
Fig. 95. Paraphyses. × 1100.
Fig. 96. Detail of medullar hyphae from assimilative areola. × 1100.
Fig. 97. Detail of basal cortex from assimilative areola. × 1100.

Figs. 98–104. ***Umbilicaria rugosa.***

Fig. 98. Mature spores. × 1100.
Fig. 99. Development of ascus through maturity. × 1100.
Fig. 100. Paraphysis. × 1100.
Fig. 101. Section through apothecium. × 35.
Fig. 102. Detail of medullar hyphae. × 1100.
Fig. 103. Section through thallus. × 35.
Fig. 104. Detail of upper cortex showing extensive decortication. × 1100.

Figs. 105–106. ***Umbilicaria pateriformis.***

Fig. 105. Section through thallus. × 55.
Fig. 106. Detail of medullar hypha. × 1100.

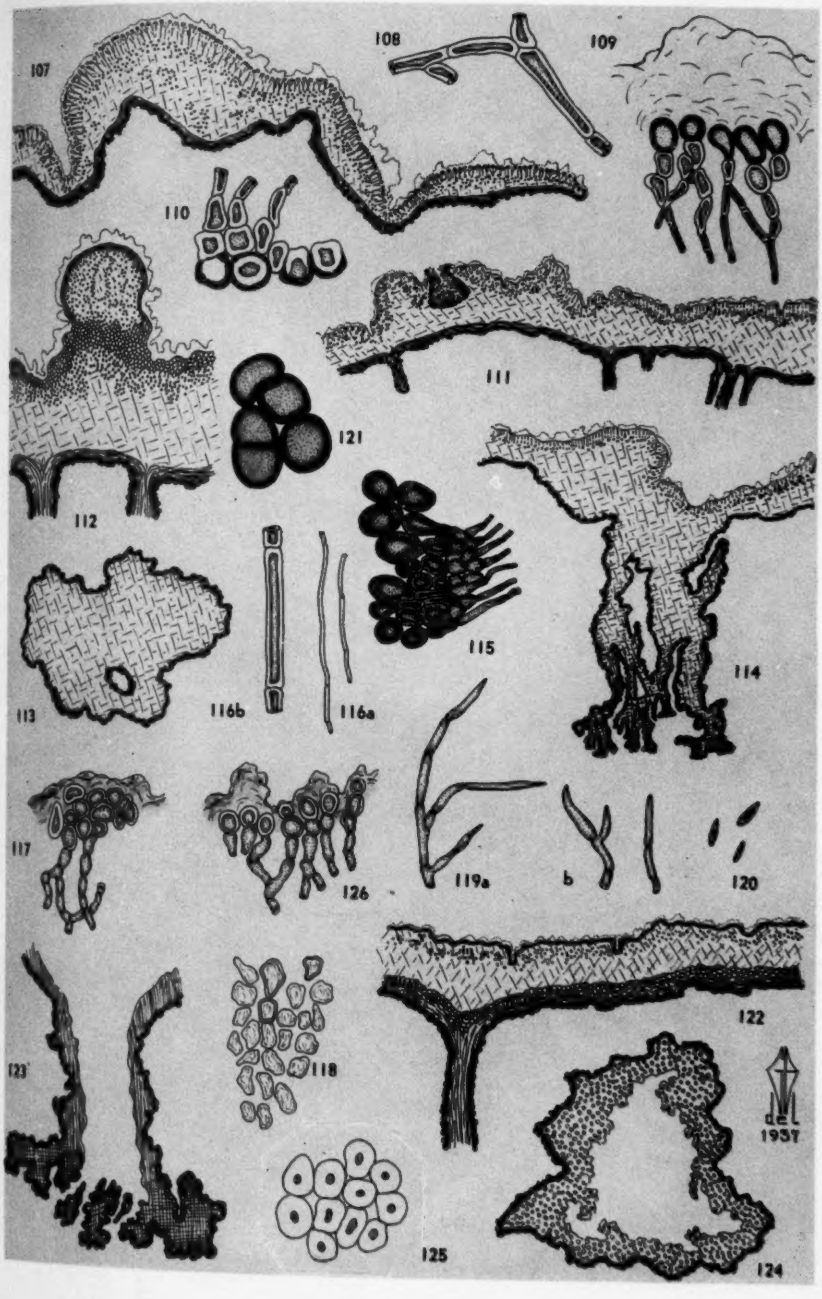


SECOND BYRD ANTARCTIC EXPEDITION

Explanation of Plate

PLATE 45

Figs. 107–110. *Umbilicaria cerebriformis.*
Fig. 107. Section through thallus. × 35.
Fig. 108. Detail of medullar hyphae. × 1100.
Fig. 109. Detail of upper cortex with decorticating zone. × 1100.
Fig. 110. Detail of basal cortex. × 1100.
Figs. 111–121. *Umbilicaria spongiosa.*
Fig. 111. Section of thallus with spermagonium. × 18.
Fig. 112. Section through an isidium. × 55.
Fig. 113. Cross-section of central thallus attachment. × 18.
Fig. 114. Longitudinal-section of thallus attachment. × 18.
Fig. 115. Detail of cortex from rhizoid margin. × 1100.
Fig. 116a. Fibrous hyphae from rhizoid. × 1100.
Fig. 116b. Medullar hyphae. × 1100.
Fig. 117. Detail of upper cortex. × 1100.
Fig. 118. Detail of upper cortex with extreme decortication. × 1100.
Figs. 119a and b. Spermatiophores. × 1100.
Fig. 120. Spermatia. × 1865.
Fig. 121. Detail of cells from outer covering of spermagonium. × 1100.
Figs. 122–126. *Umbilicaria cristata.*
Fig. 122. Section of thallus. × 55.
Fig. 123. Longitudinal-section of central thallus attachment. × 18.
Fig. 124. Cross-section of central thallus attachment. × 18.
Fig. 125. Cells from base of central attachment as seen in longitudinal view. × 1100.
Fig. 126. Detail of upper cortex. × 434.



SECOND BYRD ANTARCTIC EXPEDITION

EXPLANATION OF PLATE

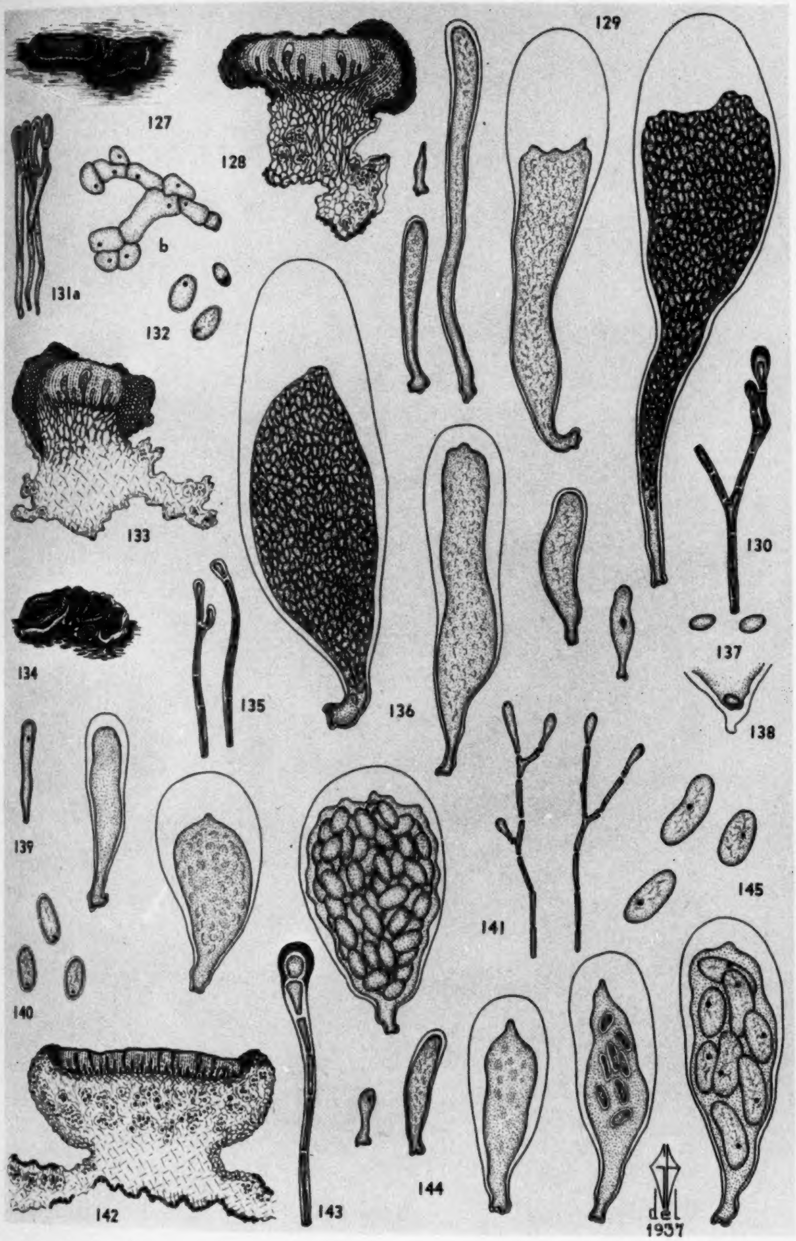
PLATE 46

Figs. 127–132. *Sarcogyne angulosa.*
Fig. 127. Habit sketch of apothecia. × 27.
Fig. 128. Section through thallus and apothecium. × 114.
Fig. 129. Development of ascus through maturity. × 1100.
Fig. 130. Paraphysis. × 1100.
Fig. 131a. Cells from the apex of the parathecium. × 1100.
Fig. 131b. Detail of hyphae from the thallus medulla. × 1100.
Fig. 132. Mature spores. × 1100. One spore from developing ascus showing nuclear condition. × 1865.

Figs. 133–138. *Sarcogyne grisea.*
Fig. 133. Section through apothecium and thallus. × 55.
Fig. 134. Habit sketch. × 14.
Fig. 135. Paraphyses. × 1100.
Fig. 136. Ascus development through maturity. × 1100.
Fig. 137. Mature spores. × 1865.
Fig. 138. Detail of ascus showing spore at very base. × 1100.

Figs. 139–141. *Biatorella arachnoidea.*
Fig. 139. Development of ascus through maturity. × 1100.
Fig. 140. Mature spores. × 1100.
Fig. 141. Paraphyses. × 1100.

Figs. 142–145. *Lecanora carbonacea.*
Fig. 142. Section through an apothecium and part of thallus. × 104.
Fig. 143. Paraphysis. × 1100.
Fig. 144. Development of ascus through maturity. × 1100.
Fig. 145. Mature spores. × 1100.



SECOND BYRD ANTARCTIC EXPEDITION

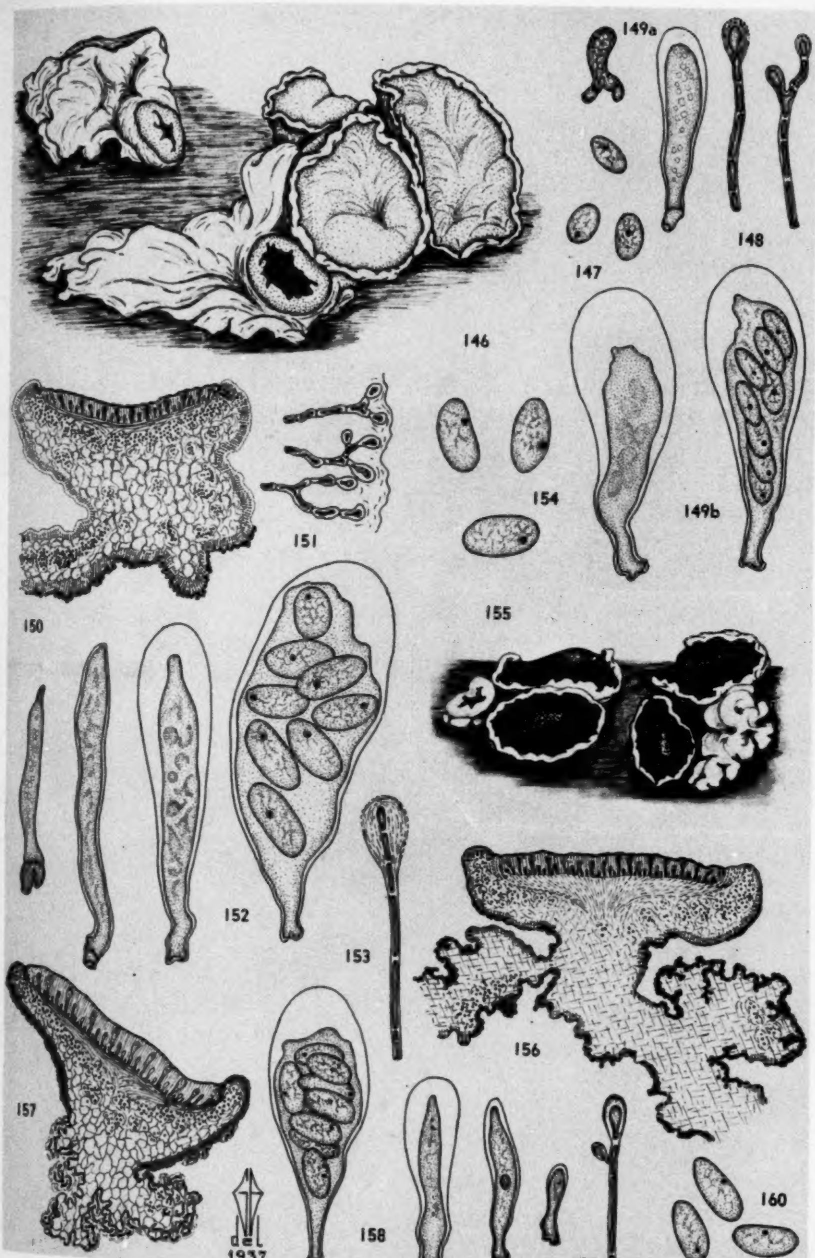
EXPLANATION OF PLATE

PLATE 47

Figs. 146–151. *Lecanora Siplei.*
Fig. 146. Habit sketch of apothecia and thallus. × 20.
Fig. 147. Mature spores. × 1100.
Fig. 148. Paraphyses. × 1100.
Fig. 149a. Young asci. × 1100.
Fig. 149b. Older asci. × 1100.
Fig. 150. Section through apothecium and a portion of thallus. × 35.
Fig. 151. Detail of fastigiate thalline margin. × 1100.

Figs. 152–156. *Lecanora griseomarginata.*
Fig. 152. Development of ascus through maturity. × 1100.
Fig. 153. Paraphysis with a gelatinous head. × 1100.
Fig. 154. Mature spores. × 1100.
Fig. 155. Habit sketch of apothecia and thallus. × 20.
Fig. 156. Section through apothecium and thallus. × 55.

Figs. 157–160. *Lecanora lilacina.*
Fig. 157. Section through apothecium and thallus showing associated foreign algae. × 55.
Fig. 158. Development of ascus through maturity. × 1100.
Fig. 159. Paraphysis. × 1100.
Fig. 160. Mature spores. × 1100.

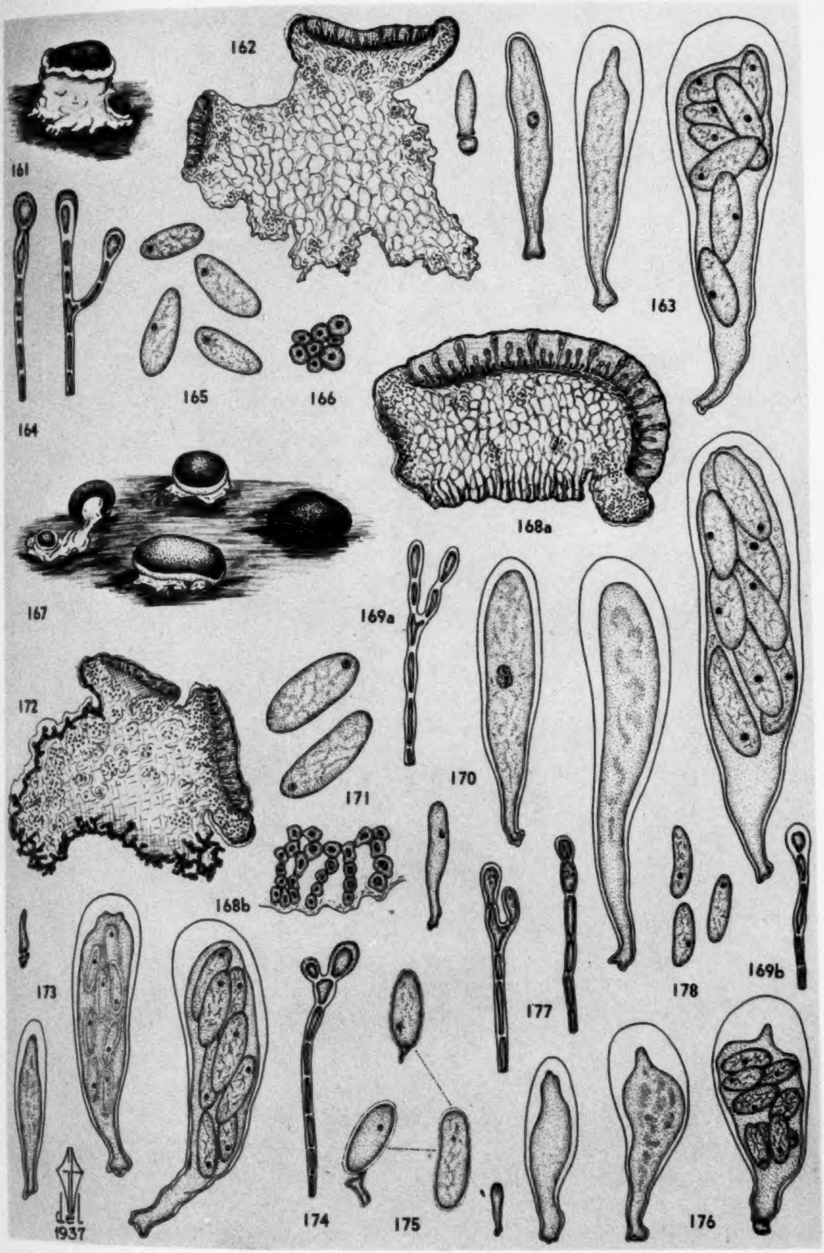


SECOND BYRD ANTARCTIC EXPEDITION

Explanation of Plate

PLATE 48

Figs. 161–166. *Lecanora lilacinofusca.*
Fig. 161. Habit sketch of thallus with apothecia. × 20.
Fig. 162. Section of thallus and apothecia. × 55.
Fig. 163. Development of ascus through maturity. × 1100.
Fig. 164. Paraphyses. × 1100.
Fig. 165. Mature spores. × 1100.
Fig. 166. Detail of cells from the outer margin adjacent to the apothecium. × 1100.
Figs. 167–171. *Lecanora subolivacea.*
Fig. 167. Habit sketch of apothecia and thallus. × 35.
Fig. 168a. Section of apothecium and thallus. × 55.
Fig. 168b. Detail of thallus margin. × 1100.
Figs. 169a and b. Paraphyses. × 1100.
Fig. 170. Development of ascus through maturity. × 1100.
Fig. 171. Mature spores. × 1100.
Figs. 172–175. *Lecanora fuscobrunnea.*
Fig. 172. Section through thallus and apothecia. × 55.
Fig. 173. Development of ascus through maturity. × 1100.
Fig. 174. Paraphysis. × 1100.
Fig. 175. Mature spores, some with appendages. × 1100.
Figs. 176–178. *Candelariella albovirens.*
Fig. 176. Development of ascus through maturity. × 1100.
Fig. 177. Paraphyses. × 1100.
Fig. 178. Mature spores. × 1100.



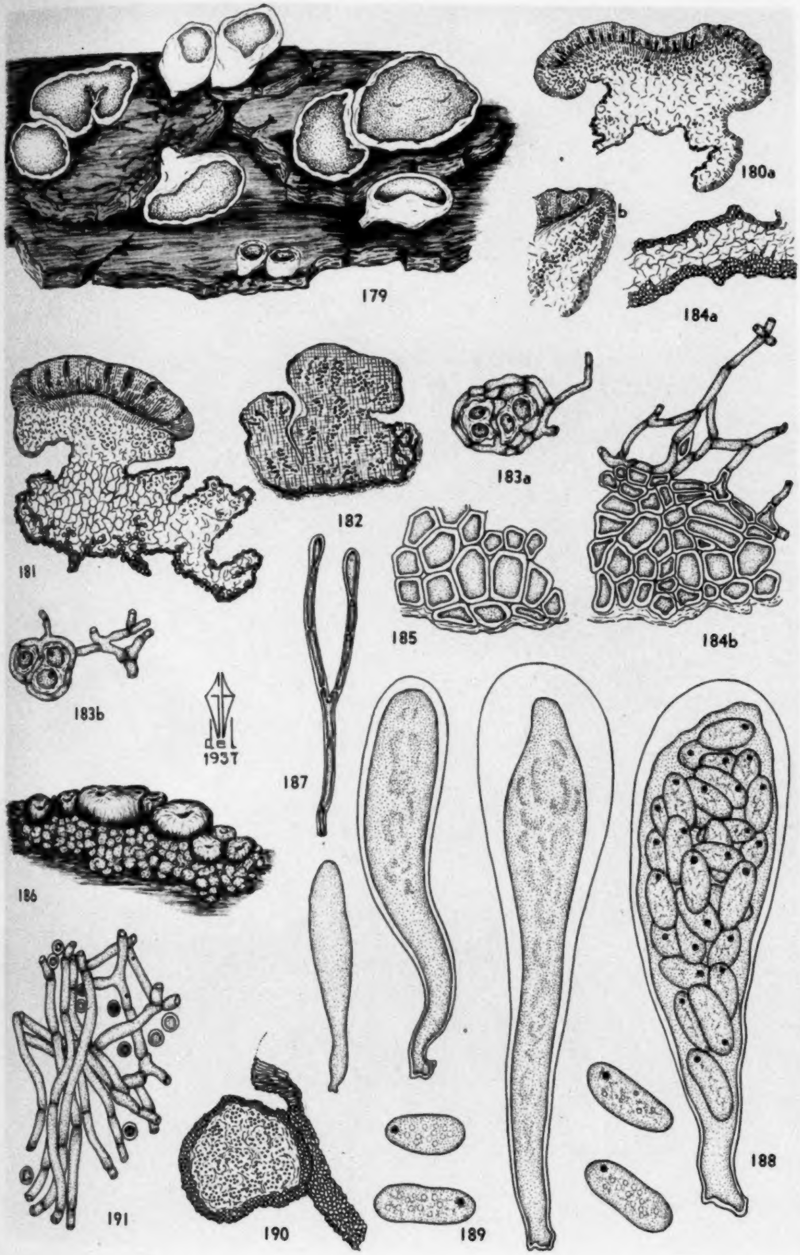
SECOND BYRD ANTARCTIC EXPEDITION

Explanation of Plate

PLATE 49

Figs. 179–180. *Candelariella albovirens.*
- Fig. 179. Habit sketch of apothecia. × 14.
- Fig. 180a. Section through apothecium and thallus. × 35.
- Fig. 180b. Portion of a section through an apothecium to show especially well-developed thalline margin. × 55.

Figs. 181–191. *Candelariella chrysea.*
- Fig. 181. Section through apothecium and thallus. × 55.
- Fig. 182. Section through assimilative areola. × 55.
- Fig. 183a. Algae surrounded by parasitic hyphae; from an assimilative areola. × 735.
- Fig. 183b. Algae and hyphae from below the apothecium. × 1100.
- Fig. 184a. Non-assimilative thallus. × 55.
- Fig. 184b. Basal cortex of non-assimilative thallus. × 434.
- Fig. 185. Basal cortex of assimilative thallus. × 735.
- Fig. 186. Habit sketch of assimilative thallus with apothecia. × 10.
- Fig. 187. Paraphysis. × 1100.
- Fig. 188. Development of ascus through maturity. × 1100.
- Fig. 189. Mature spores. × 1100.
- Fig. 190. Section through an isidium. × 177.
- Fig. 191. Detail of medullar hyphae. × 434.



SECOND BYRD ANTARCTIC EXPEDITION

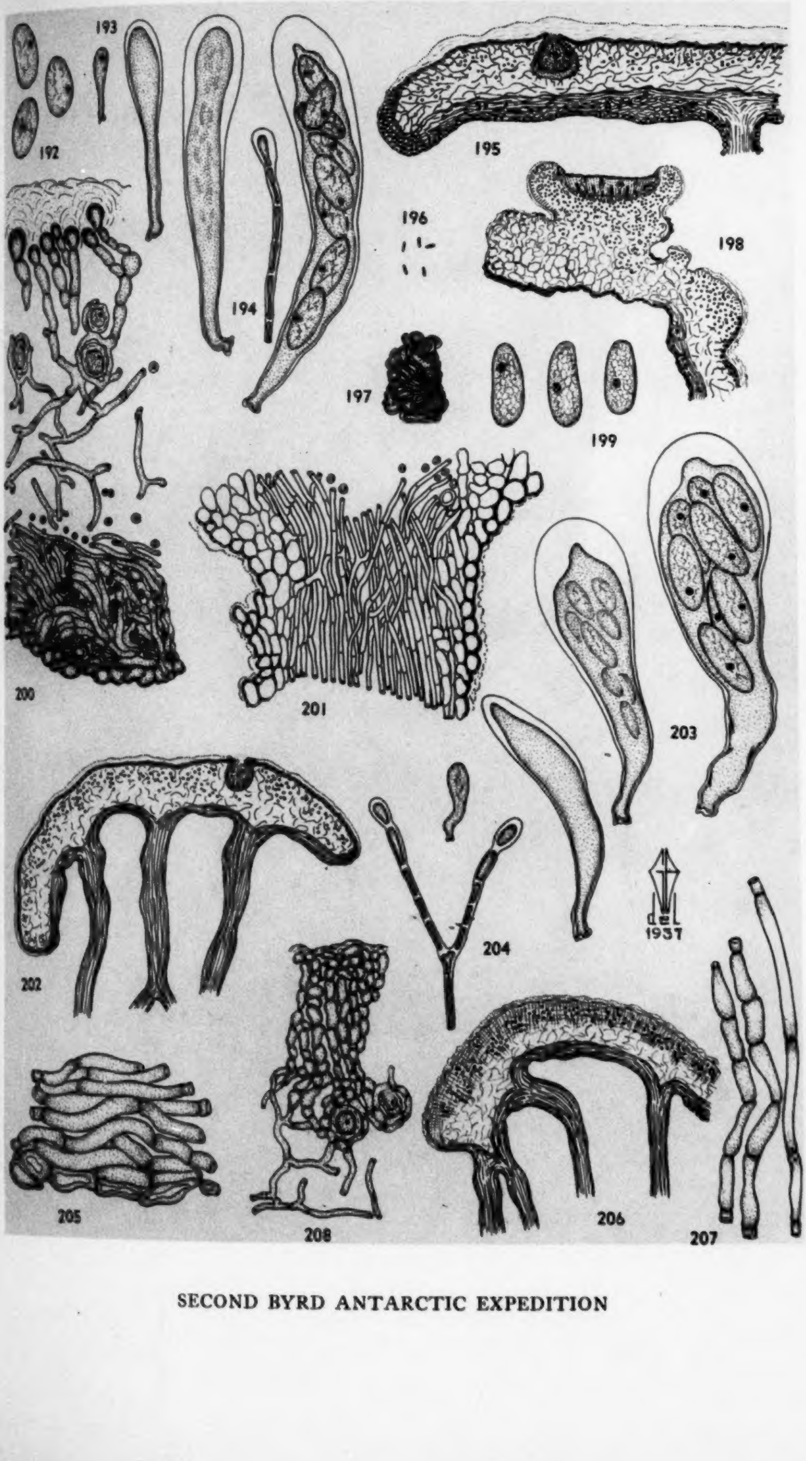
Explanation of Plate

PLATE 50

Figs. 192–201. *Parmelia variolosa.*
- Fig. 192. Mature spores. × 1100.
- Fig. 193. Development of ascus through maturity. × 1100.
- Fig. 194. Paraphysis. × 1100.
- Fig. 195. Section of thallus with spermagonium. × 104.
- Fig. 196. Spermatia. × 1100.
- Fig. 197. Detail of cells from spermagonium wall. × 1100.
- Fig. 198. Section through apothecium and thallus. × 55.
- Fig. 199. Mature spores. × 1100.
- Fig. 200. Detail of thallus from upper through lower surface. × 434.
- Fig. 201. Detail of rhizoid. × 434.

Figs. 202–204. *Parmelia Coreyi.*
- Fig. 202. Section of thallus and spermagonium. × 55.
- Fig. 203. Development of ascus through maturity. × 1100.
- Fig. 204. Paraphysis. × 1100.

Figs. 205–208. *Parmelia griseola.*
- Fig. 205. Detail of lower cortex. × 1100.
- Fig. 206. Section of thallus. × 55.
- Fig. 207. Detail of cells from surface of rhizoid inwards. × 1100.
- Fig. 208. Upper cortex and medulla. × 434.

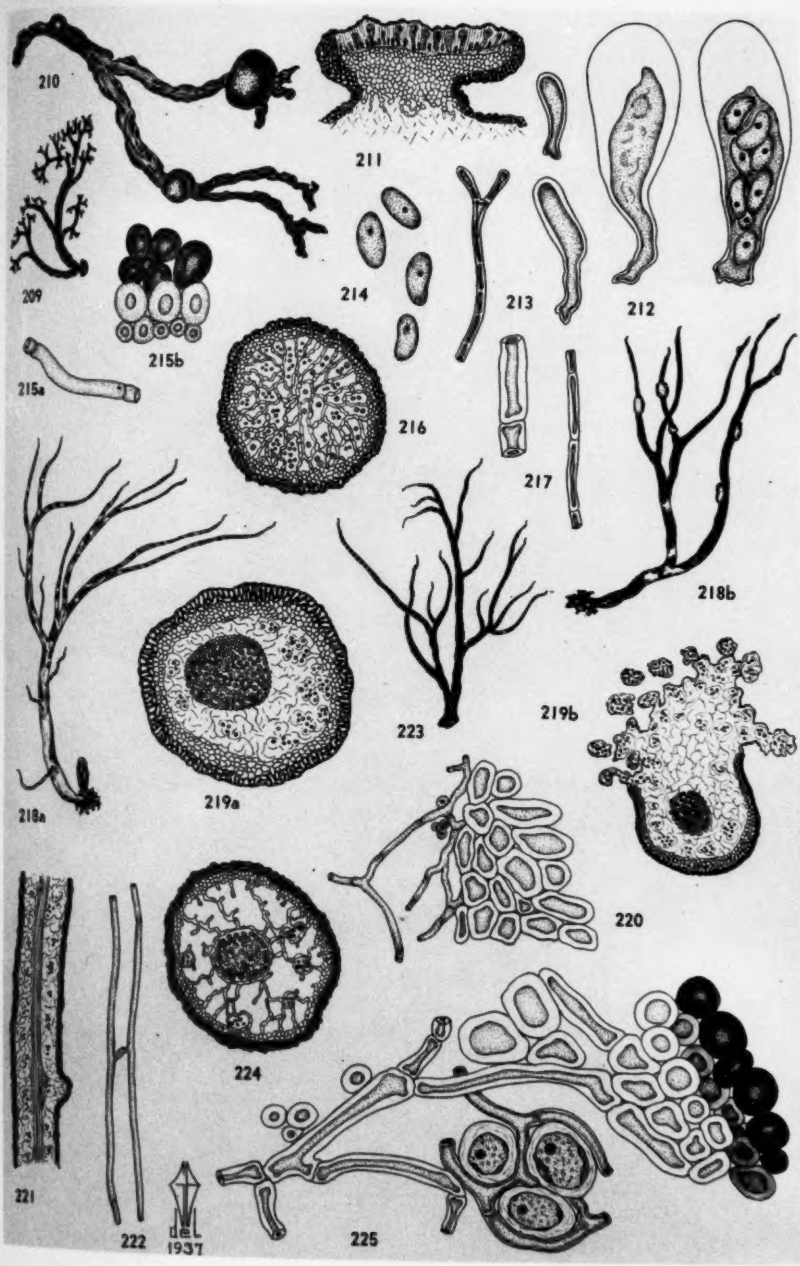


SECOND BYRD ANTARCTIC EXPEDITION

EXPLANATION OF PLATE

PLATE 51

Figs. 209–216. *Alectoria antarctica.*
Fig. 209. Habit sketch. × 6.
Fig. 210. Detail of thallus ends with apothecia. × 35.
Fig. 211. Section of apothecium. × 55.
Fig. 212. Development of ascus through maturity. × 1100.
Fig. 213. Paraphysis. × 1100.
Fig. 214. Mature spores. × 1100.
Fig. 215a. Hypha from medulla. × 1100.
Fig. 215b. Detail of cortex. × 1100.
Fig. 216. Cross-section of thallus. × 177.
Figs. 217–222. *Usnea antarctica.*
Fig. 217. Hyphae from medulla. × 1100.
Fig. 218a. Habit sketch of radiate thallus with alternate dark and light bands. × 2.
Fig. 218b. Habit sketch of radiate thallus entirely black except for scattered yellow floccose pustules. × 2.
Fig. 219a. Cross-section of thallus, type illustrated in fig. 218a. × 104.
Fig. 219b. Cross-section of thallus, type illustrated in fig. 218b. × 55.
Fig. 220. Detail of medulla and cortex junction. × 1100.
Fig. 221. Longitudinal-section of thallus, type fig. 218a. × 18.
Fig. 222. Hyphae from chondroid axis in longtitudinal view. × 1100.
Figs. 223–225. *Usnea frigida.*
Fig. 223. Habit sketch. × 3.
Fig. 224. Cross-section of thallus. × 104.
Fig. 225. Detail of cells from central "stele" to cortex. × 1100.

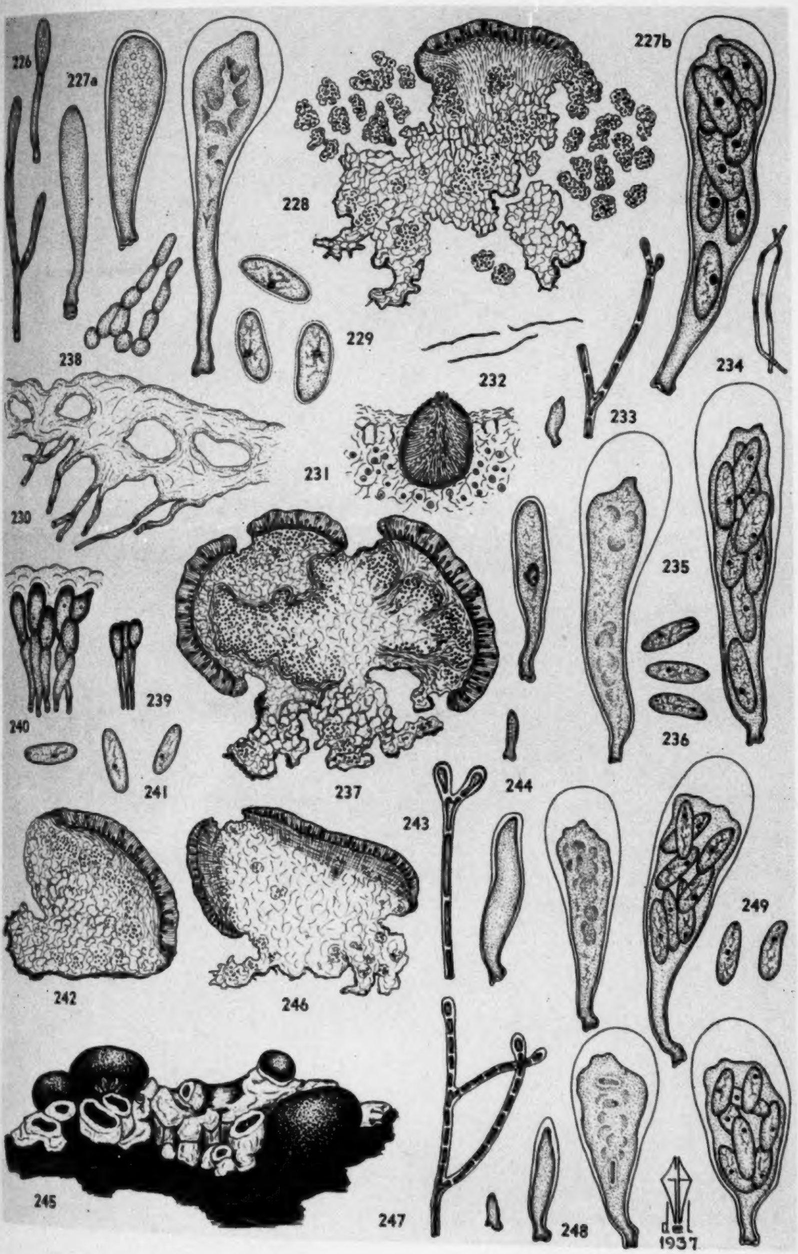


SECOND BYRD ANTARCTIC EXPEDITION

Explanation of Plate

PLATE 52

Figs. 226–229. *Protoblastenia flava.*
Fig. 226. Paraphyses. × 1100.
Fig. 227. Development of ascus through maturity. × 1100.
Fig. 228. Section through thallus and apothecium. × 55.
Fig. 229. Mature spores. × 1100.
Figs. 230–238. *Protoblastenia aurea.*
Fig. 230. Detail of decomposed cortex in spermagonial region. × 1100.
Fig. 231. Detail of spermagonium. × 177.
Fig. 232. Spermatia. × 1100.
Fig. 233. Paraphysis. × 1100.
Fig. 234. Medullar hyphae. × 1100.
Fig. 235. Development of ascus through maturity. × 1100.
Fig. 236. Mature spores. × 1100.
Fig. 237. Section of apothecia and thallus. × 18.
Fig. 238. Marginal cells. × 1100.
Figs. 239–245. *Protoblastenia alba.*
Fig. 239. Detail of marginal parathecial cells. × 1100.
Fig. 240. Detail of marginal thallus cells. × 1100.
Fig. 241. Mature spores. × 1100.
Fig. 242. Section of thallus with apothecium. × 55.
Fig. 243. Paraphysis. × 1100.
Fig. 244. Development of ascus through maturity. × 1100.
Fig. 245. Habit sketch of thallus and apothecia in various stages of development. × 14.
Figs. 246–249. *Protoblastenia citrinigricans.*
Fig. 246. Section through apothecia and thallus. × 35.
Fig. 247. Paraphysis. × 1100.
Fig. 248. Development of ascus. × 1100.
Fig. 249. Mature spores. × 1100.



SECOND BYRD ANTARCTIC EXPEDITION

EXPLANATION OF PLATE

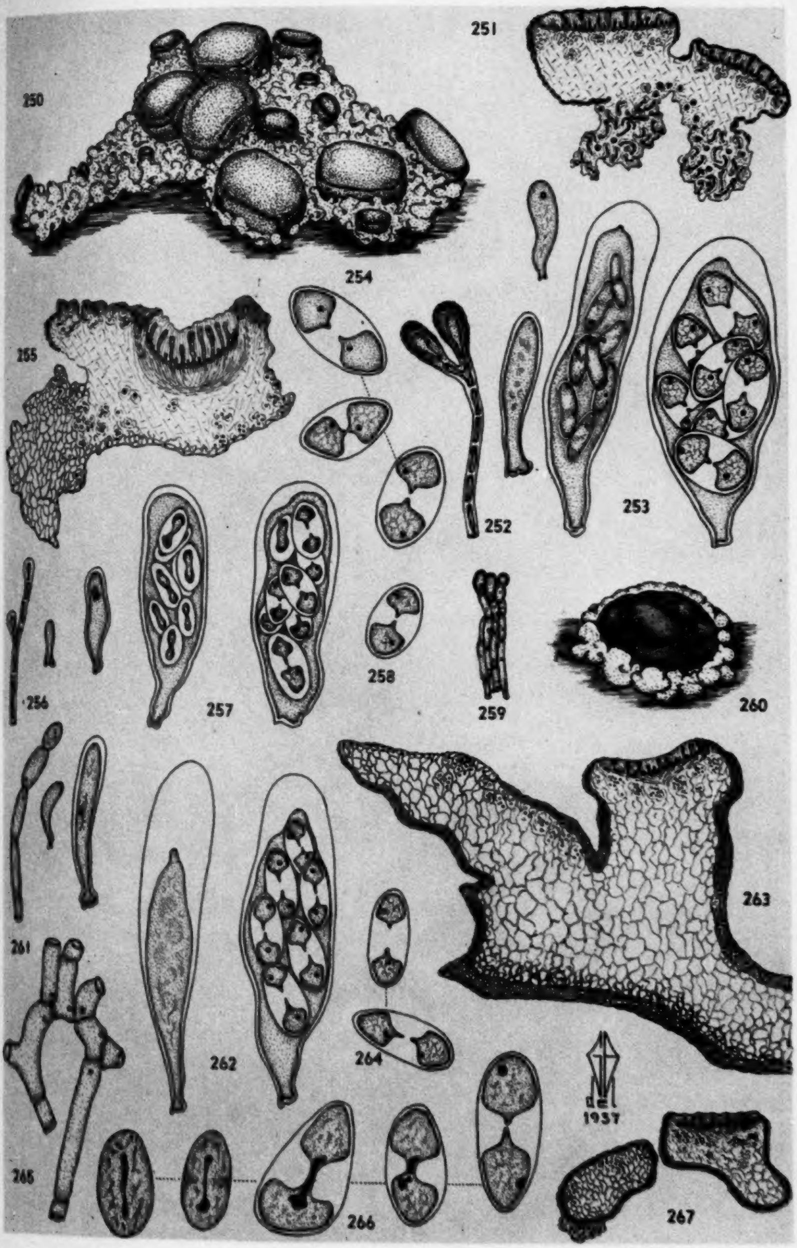
PLATE 53

Figs. 250–254. *Blastenia succinea.*
- Fig. 250. Habit sketch. × 35.
- Fig. 251. Section through apothecia showing associated basal algae. × 55.
- Fig. 252. Paraphysis. × 1100.
- Fig. 253. Development of ascus through maturity. × 1100.
- Fig. 254. Mature spores showing variation in size and shape. × 1100.

Figs. 255–260. *Blastenia grisea.*
- Fig. 255. Section through thallus and apothecium. × 104.
- Fig. 256. Paraphysis. × 1100.
- Fig. 257. Development of ascus through maturity. × 1100.
- Fig. 258. Mature spore. × 1100.
- Fig. 259. Detail from upper marginal cortex of the thallus. × 1100.
- Fig. 260. Habit sketch. × 27.

Figs. 261–266. *Kuttlingeria rufa.*
- Fig. 261. Paraphysis. × 1100.
- Fig. 262. Development of ascus through maturity. × 1100.
- Fig. 263. Section through thallus and apothecium. × 55.
- Fig. 264. Mature spores. × 1100.
- Fig. 265. Medullar hyphae. × 1100.
- Fig. 266. Development of spores showing nuclear-division stages preceding the formation of the mature spore, the latter with two distinct cells, each uninucleate. × 1865.

Fig. 267. *Kuttlingeria rutilans.* Section through thallus lobe and apothecium. × 35.

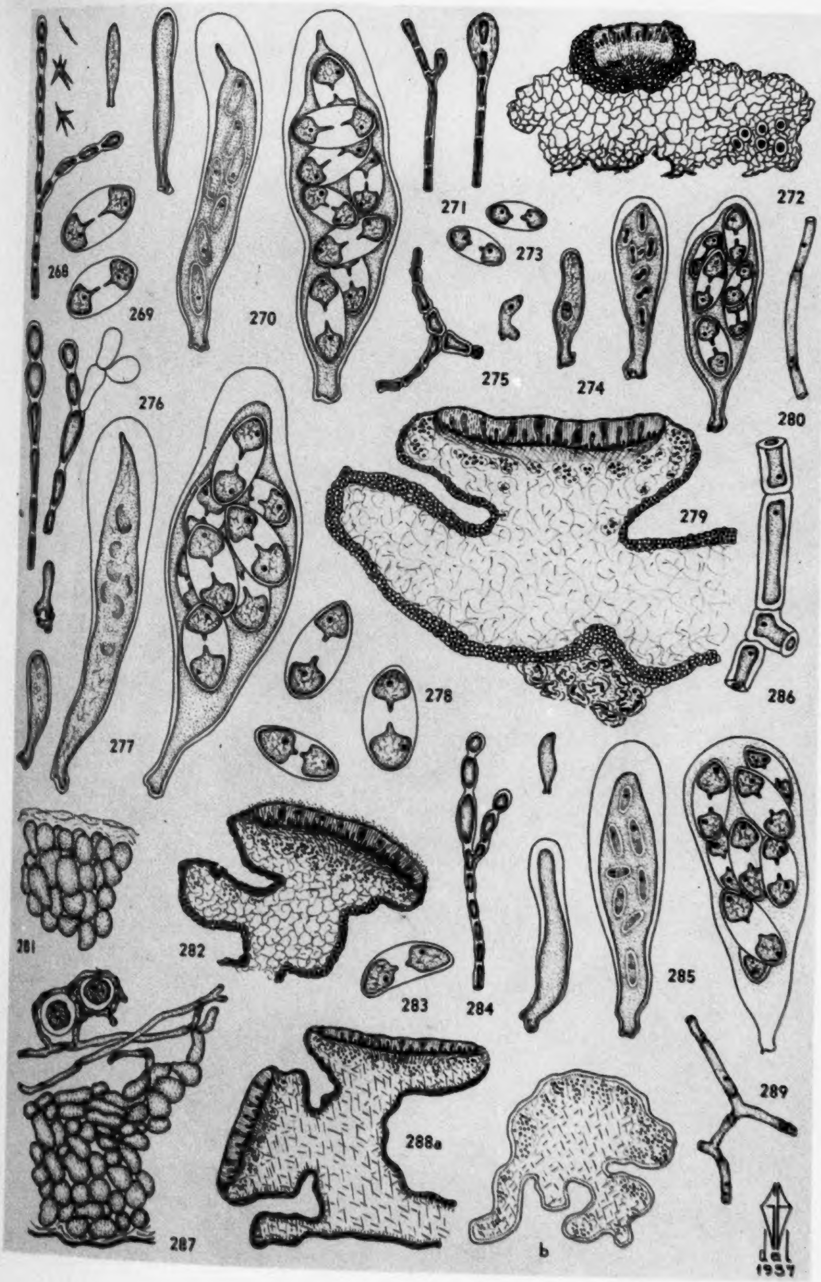


SECOND BYRD ANTARCTIC EXPEDITION

Explanation of Plate

PLATE 54

Figs. 268–270. *Kuttlingeria rutilans.*
Fig. 268. Paraphysis and crystals from the epithecium. × 1100.
Fig. 269. Mature spores. × 1100.
Fig. 270. Development of ascus through maturity. × 1100.
Figs. 271–275. *Huea flava.*
Fig. 271. Paraphyses. × 1100.
Fig. 272. Section through thallus and apothecium. × 145.
Fig. 273. Mature spores. × 1100.
Fig. 274. Development of ascus through maturity. × 1100.
Fig. 275. Detail of hyphae from medulla. × 1100.
Figs. 276–280. *Polycauliona pulvinata.*
Fig. 276. Paraphyses. × 1100.
Fig. 277. Development of ascus through maturity. × 1100.
Fig. 278. Mature spores. × 1100.
Fig. 279. Section through thallus and apothecium. × 55.
Fig. 280. Detail of medullar hypha. × 1100.
Figs. 281–286. *Polycauliona sparsa.*
Fig. 281. Detail of upper cortex. × 1100.
Fig. 282. Section through thallus and apothecium. × 35.
Fig. 283. Mature spore. × 1100.
Fig. 284. Paraphysis. × 1100.
Fig. 285. Development of ascus through maturity. × 1100.
Fig. 286. Detail of medullar hyphae. × 1100.
Figs. 287–289. *Gasparrinia Siplei.*
Fig. 287. Detail of lower cortex. × 1100.
Fig. 288a and b. Section through apothecia and thallus lobe respectively. × 35.
Fig. 289. Detail of medullar hyphae. × 1100.



SECOND BYRD ANTARCTIC EXPEDITION

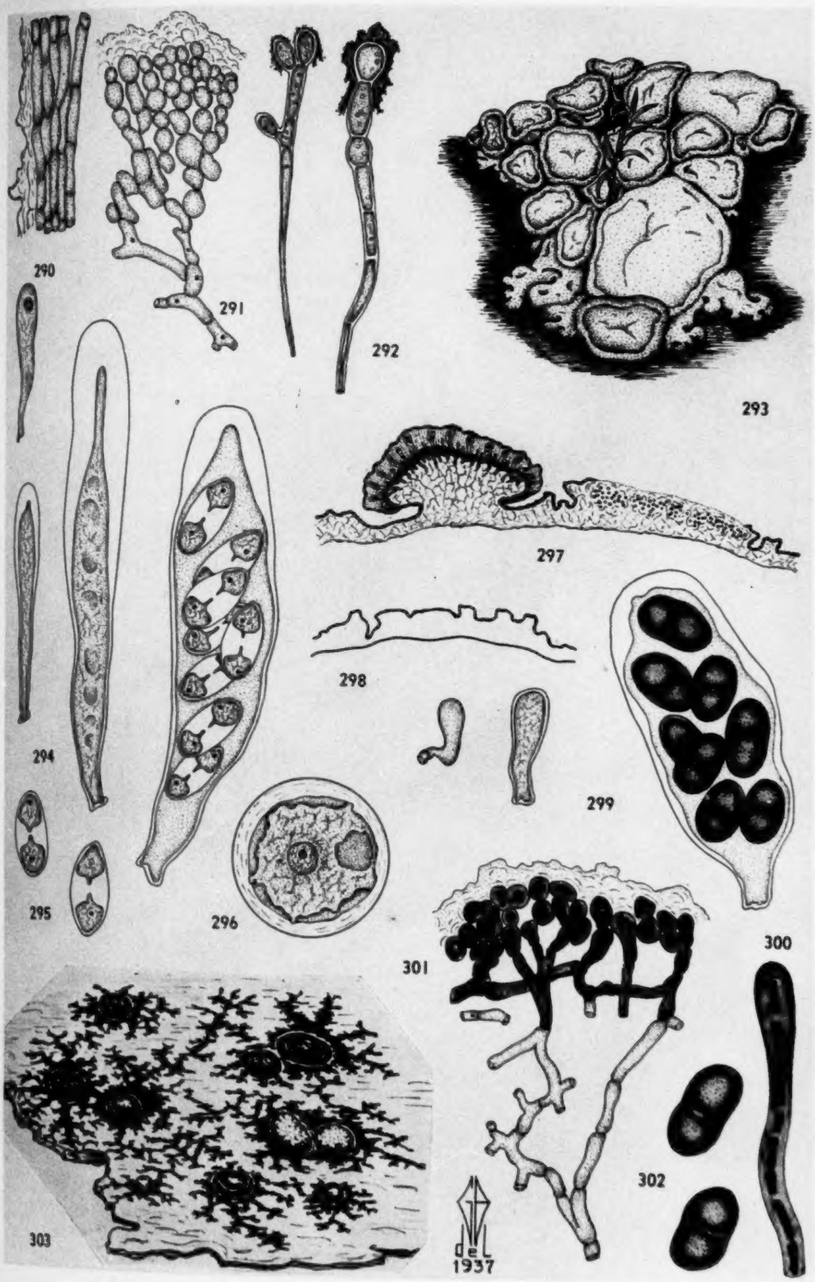
EXPLANATION OF PLATE

PLATE 55

Figs. 290–296. *Gasparrinia Siplei.*
- Fig. 290. Detail of cells from rhizoidal attachment. × 1100.
- Fig. 291. Detail of upper cortex with decorticating layers. × 1100.
- Fig. 292. Paraphyses. × 1100.
- Fig. 293. Habit sketch. × 14.
- Fig. 294. Development of ascus through maturity. × 1100.
- Fig. 295. Mature spores. × 1100.
- Fig. 296. Alga from thallus. × 1865.

Figs. 297–302. *Buellia flavoplana.*
- Fig. 297. Section through apothecium and assimilative areola. × 35.
- Fig. 298. Section through non-assimilative thallus. × 35.
- Fig. 299. Development of ascus through maturity. × 1100.
- Fig. 300. Paraphysis. × 1100.
- Fig. 301. Detail of non-assimilative areola. × 1100.
- Fig. 302. Mature spores. × 1100.

Fig. 303. *Buellia stellata.* Habit sketch. × 25.

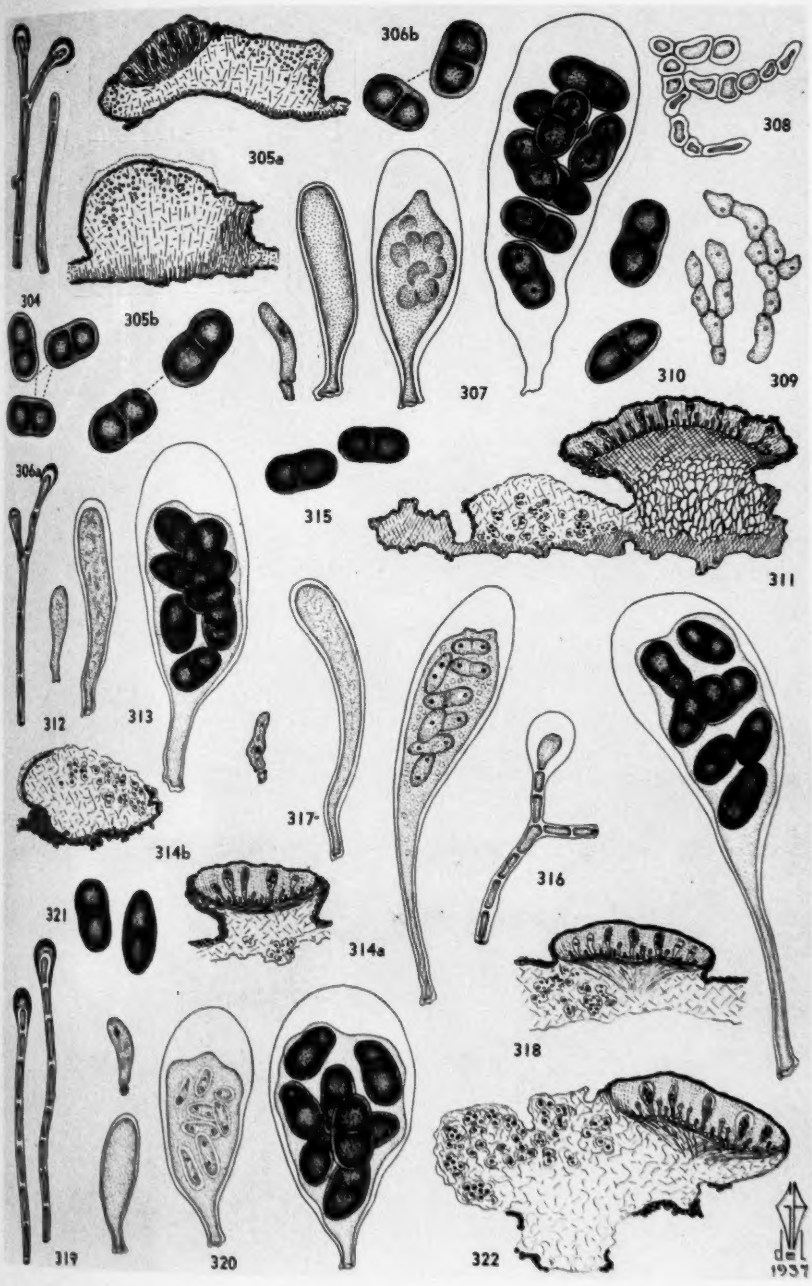


SECOND BYRD ANTARCTIC EXPEDITION

Explanation of Plate

PLATE 56

Figs. 304–307. *Buellia stellata.*
  Fig. 304. Paraphyses. × 1100.
  Figs. 305a and b. Sections through thalli and apothecium. × 104.
  Figs. 306a and b. Mature spores from various sources. × 1100.
  Fig. 307. Development of ascus through maturity. × 1100.
Figs. 308–311. *Buellia chrysea.*
  Fig. 308. Detail of cells from inner part of non-assimilative thallus. × 1100.
  Fig. 309. Detail of cells from outer surface of non-assimilative thallus. × 1100.
  Fig. 310. Mature spores. × 1100.
  Fig. 311. Section through non-assimilative, assimilative thalli, and apothecium. × 55.
Figs. 312–315. *Buellia brunnescens.*
  Fig. 312. Paraphysis. × 1100.
  Fig. 313. Development of ascus through maturity. × 1100.
  Figs. 314a and b. Sections through apothecium and assimilative thallus. × 104.
  Fig. 315. Mature spores. × 1100.
Figs. 316–317. *Buellia chrysea.*
  Fig. 316. Paraphysis. × 1100.
  Fig. 317. Development of ascus through maturity. × 1100.
Figs. 318–321. *Buellia pallida.*
  Fig. 318. Section through thallus and apothecium. × 104.
  Fig. 319. Paraphysis. × 1100.
  Fig. 320. Development of ascus through maturity. × 1100.
  Fig. 321. Mature spores. × 1100.
Fig. 322. *Buellia alboradians.* Section through thallus and apothecium. × 177.



SECOND BYRD ANTARCTIC EXPEDITION

Explanation of Plate

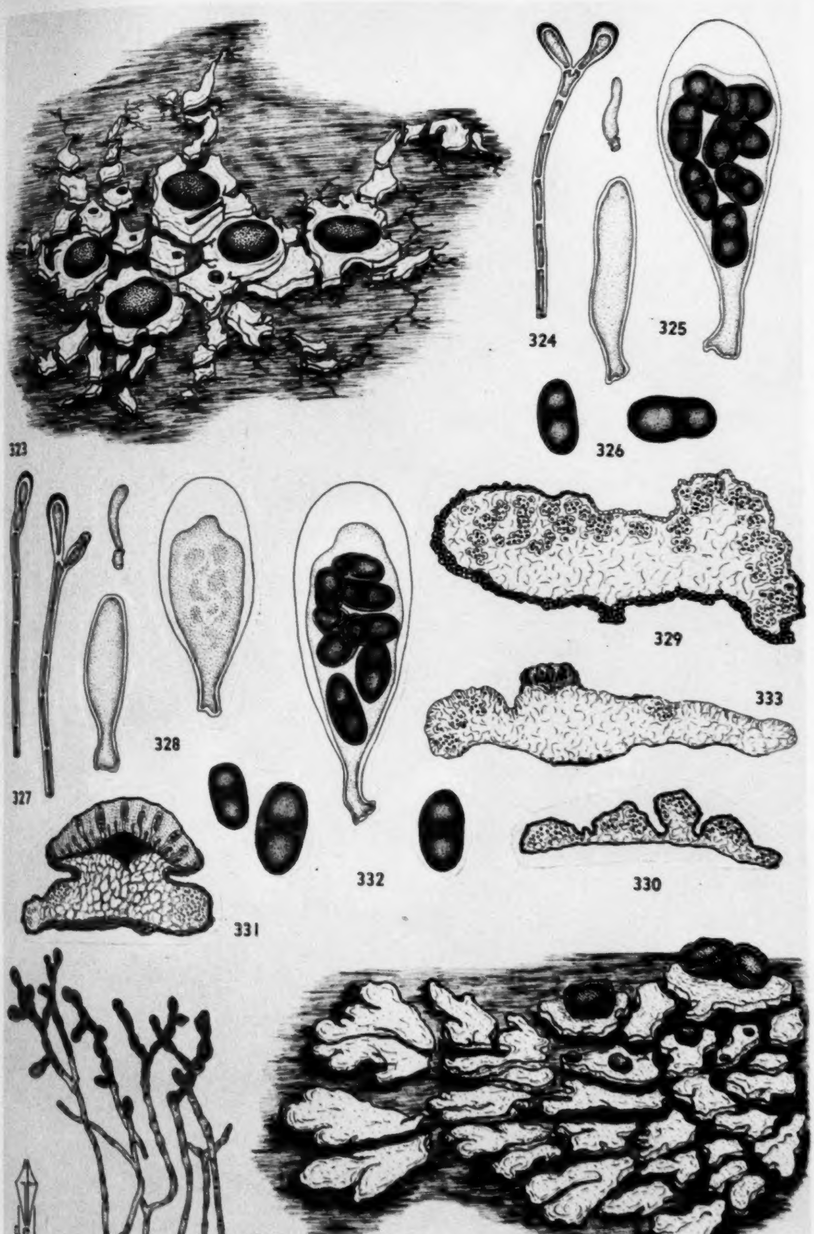
PLATE 57

Figs. 323–326. *Buellia alboradians.*
- Fig. 323. Habit sketch. × 35.
- Fig. 324. Paraphysis. × 1100.
- Fig. 325. Development of ascus through maturity. × 1100.
- Fig. 326. Mature spores. × 1100.

Figs. 327–332. *Buellia frigida.*
- Fig. 327. Paraphyses. × 1100.
- Fig. 328. Development of ascus through maturity. × 1100.
- Fig. 329. Section through assimilative thallus. × 55.
- Fig. 330. Section through darkened assimilative thallus at margin of plant. × 55.
- Fig. 331. Section through apothecium. × 55.
- Fig. 332. Mature spores. × 1100.

Figs. 333–334. *Buellia floccosa.*
- Fig. 333. Section through thallus and apothecium. × 55.
- Fig. 334. Detail of outer cortex. × 434.

Fig. 335. *Buellia frigida.* Habit sketch. × 20.



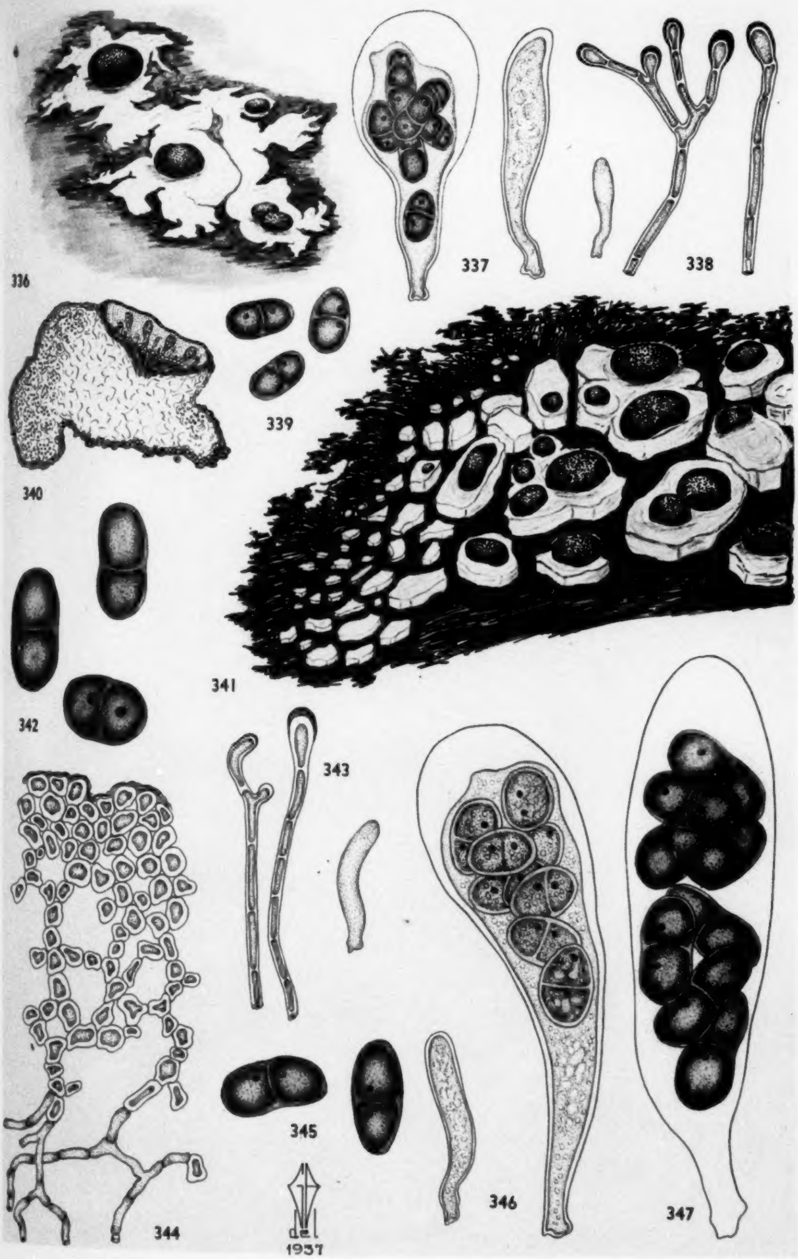
SECOND BYRD ANTARCTIC EXPEDITION

EXPLANATION OF PLATE

PLATE 58

Figs. 336–339. *Buellia floccosa.*
- Fig. 336. Habit sketch. × 40.
- Fig. 337. Development of ascus through maturity. × 1100.
- Fig. 338. Paraphyses. × 1100.
- Fig. 339. Mature spores. × 1100.

Figs. 340–347. *Buellia olivaceobrunnea.*
- Fig. 340. Section through thallus and apothecium. × 104.
- Fig. 341. Habit sketch. × 25.
- Fig. 342. Mature spores. × 1865.
- Fig. 343. Paraphyses. × 1100.
- Fig. 344. Detail of medulla and cortex. × 434.
- Fig. 345. Mature spores. × 1100.
- Figs. 346–347. Development of ascus through maturity. × 1100.

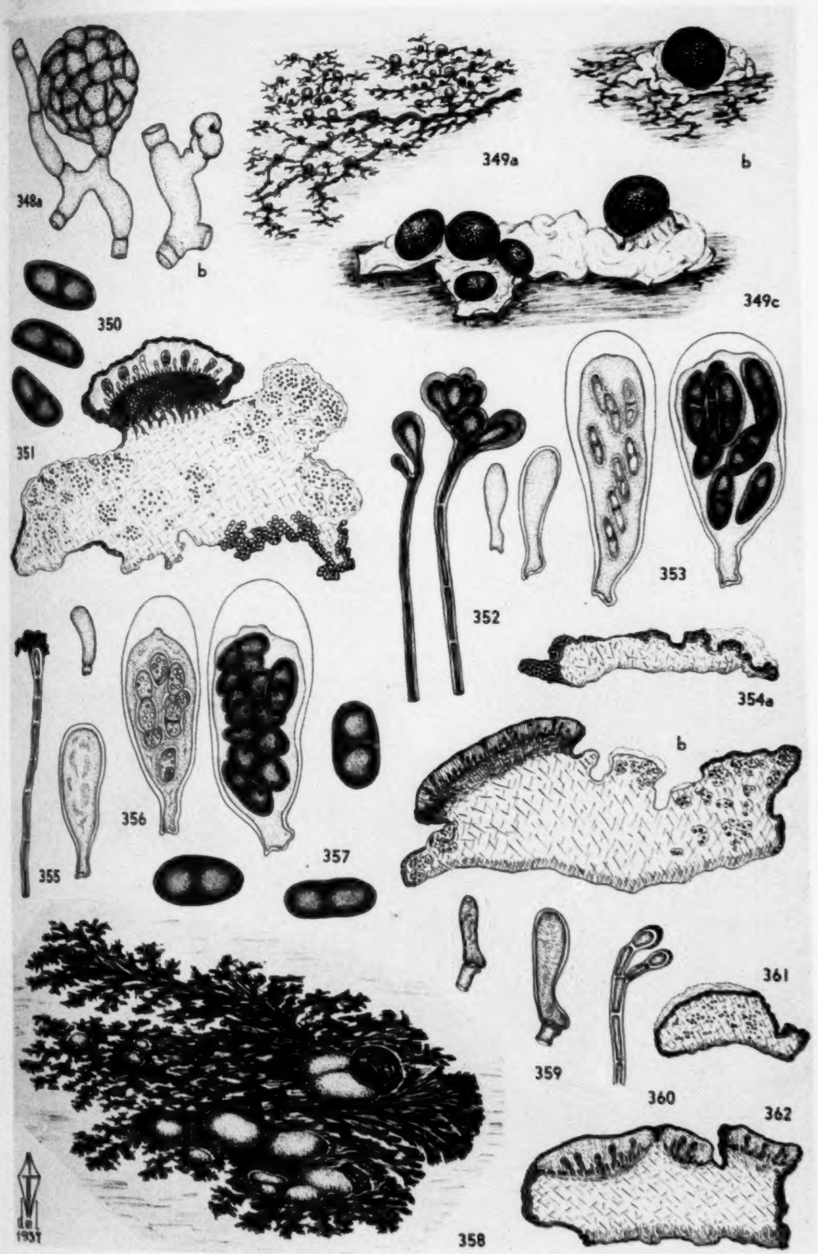


SECOND BYRD ANTARCTIC EXPEDITION

Explanation of Plate

PLATE 59

Figs. 348–353. *Buellia muscicola.*
Fig. 348a. Bulbil from a young plant. × 1100.
Fig. 348b. Beginning of bulbil formation. × 1100.
Fig. 349a. Habit sketch of very young thallus. × 35.
Fig. 349b. Habit sketch of apothecium and thallus with non-assimilative strands still prominent. × 35.
Fig. 349c. Mature plant. × 35.
Fig. 350. Mature spores. × 1100.
Fig. 351. Section through apothecium and thallus. × 104.
Fig. 352. Paraphyses showing stages in development. × 1100.
Fig. 353. Development of ascus through maturity. × 1100.
Figs. 354–357. *Buellia grisea.*
Fig. 354a. Section through non-assimilative thallus. × 104.
Fig. 354b. Section through assimilative thallus and apothecium. × 55.
Fig. 355. Paraphysis. × 1100.
Fig. 356. Development of ascus through maturity. × 1100.
Fig. 357. Mature spores. × 1100.
Figs. 358–362. *Buellia dendritica.*
Fig. 358. Habit sketch. × 25.
Fig. 359. Young ascus stages. × 1100.
Fig. 360. Paraphysis. × 1100.
Fig. 361. Section through assimilative areola. × 104.
Fig. 362. Section through apothecia. × 104.



SECOND BYRD ANTARCTIC EXPEDITION

Explanation of Plate

PLATE 60

Figs. 363–364. *Buellia dendritica.*

Fig. 363. Development of ascus through maturity, including an abnormal 2-spored ascus with vestiges of the other spores. × 1100.

Fig. 364. Mature spores. × 1100.

Figs. 365–369. *Buellia albida.*

Fig. 365. Habit sketch. × 35.

Fig. 366. Paraphysis. × 1100.

Fig. 367. Development of ascus through maturity, including an abnormal 2-spored ascus. × 1100.

Fig. 368. Mature spores. × 1100.

Fig. 369. Section through thallus and apothecium. × 177.

Figs. 370–375. *Buellia Russellii.*

Fig. 370. Habit sketch. × 35.

Fig. 371. Section through thallus and apothecium. × 104.

Fig. 372a. Developing spore with canal still present between the two cells. × 1865.

Fig. 372b. Spores showing successive development. × 1100.

Fig. 373. Paraphysis. × 1100.

Fig. 374. Development of ascus through maturity. × 1100.

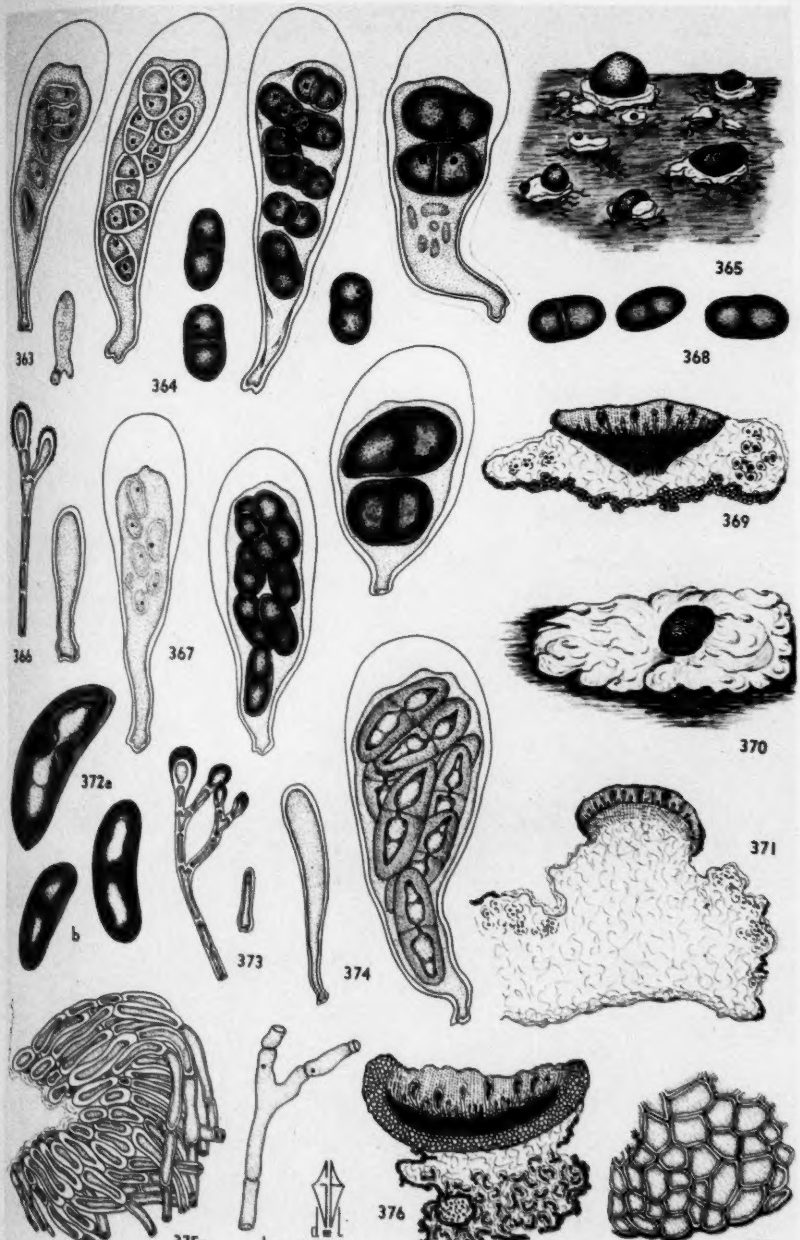
Fig. 375a. Cells from thallus margin and adjoining epithecium. × 1100.

Fig. 375b. Medullar hyphae. × 1100.

Figs. 376–377. *Buellia (Diplotomma) Siplei.*

Fig. 376. Section through thallus and basal algae. × 104.

Fig. 377. Detail of basal parathecium. × 1100.



SECOND BYRD ANTARCTIC EXPEDITION

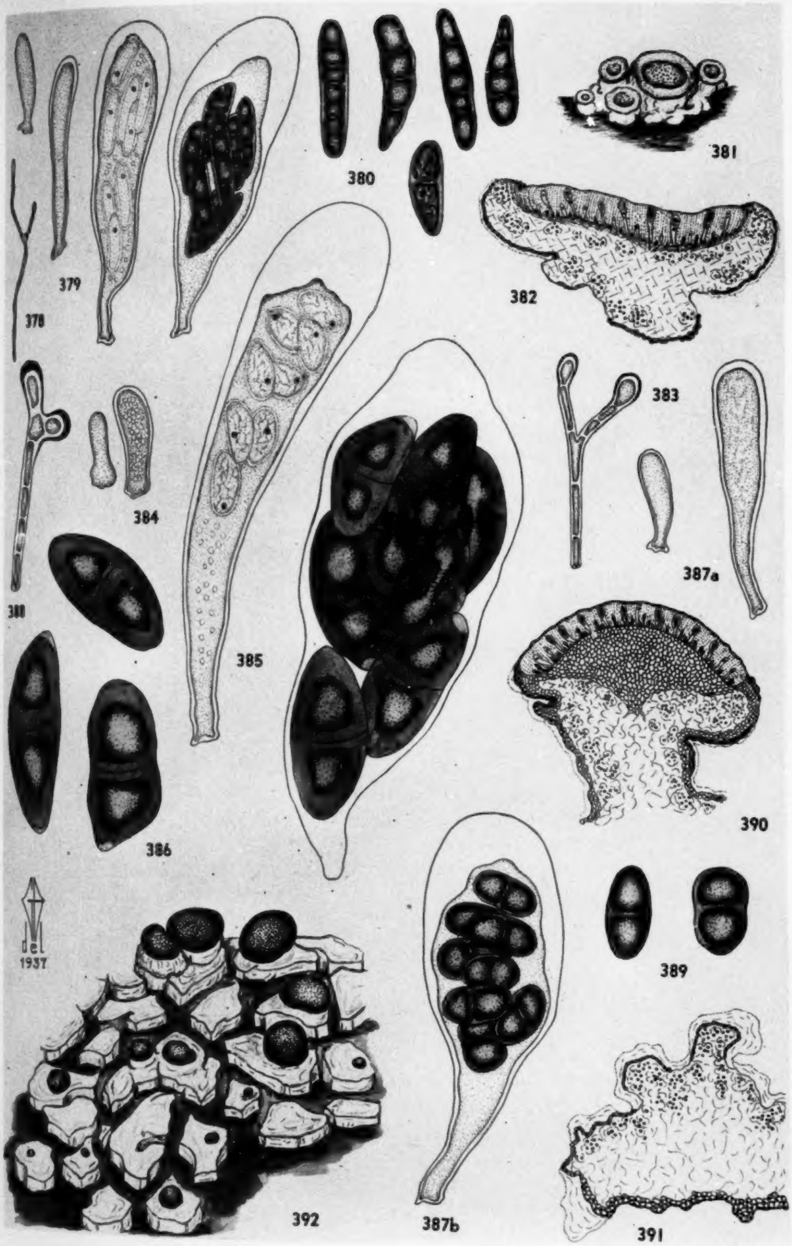
Explanation of Plate

PLATE 61

Figs. 378–380. ***Buellia (Diplotomma) Siplei.***
- Fig. 378. Paraphysis. × 1100.
- Fig. 379. Development of ascus. × 1100.
- Fig. 380. Spores in varying degrees of maturity. × 1100.

Figs. 381–386. ***Rinodina olivaceobrunnea.***
- Fig. 381. Habit sketch. × 50.
- Fig. 382. Section through apothecium. × 55.
- Fig. 383. Paraphysis. × 1100.
- Fig. 384. Young asci. × 1100.
- Fig. 385. Older and mature asci. × 1100.
- Fig. 386. Mature spores. × 1100.

Figs. 387–392. ***Rinodina sordida.***
- Figs. 387a and b. Development of ascus. × 1100.
- Fig. 388. Paraphysis. × 1100.
- Fig. 389. Mature spores. × 1100.
- Fig. 390. Section through apothecium. × 55.
- Fig. 391. Section through thallus. × 55.
- Fig. 392. Habit sketch. × 20.



SECOND BYRD ANTARCTIC EXPEDITION

EXPLANATION OF PLATE

PLATE 62

Figs. 393–395. *Thelidium parvum.*
- Fig. 393. Mature spores. × 1865.
- Fig. 394. Perithecium and associated algae. × 434.
- Fig. 395. Development of ascus. × 1100.

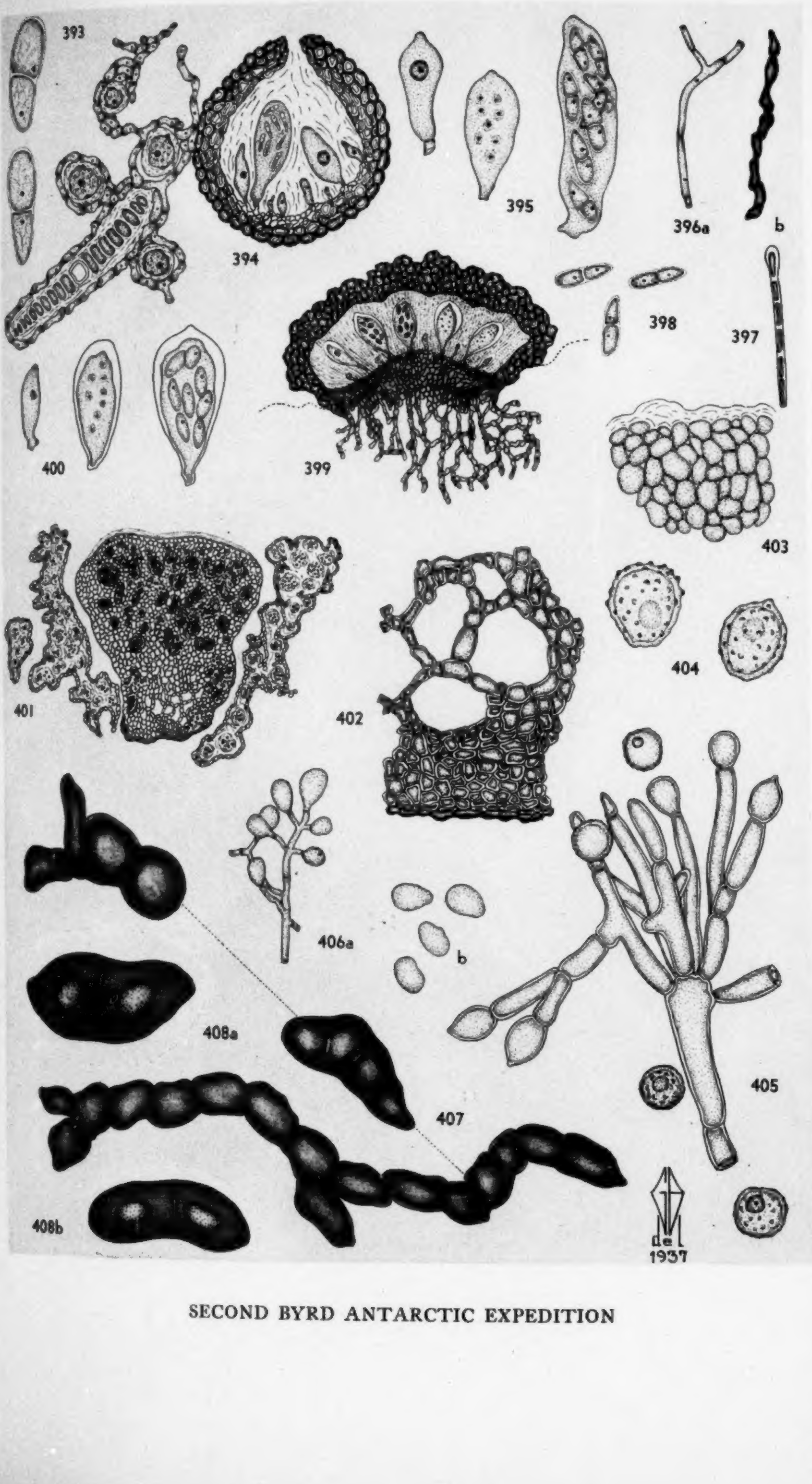
Figs. 396–400. *Diplonaevia Parmeliae.*
- Fig. 396a. Detail of hyphae of host, *Parmelia.* × 1100.
- Fig. 396b. Detail of hyphae of parasite. × 1100.
- Fig. 397. Paraphysis. × 1100.
- Fig. 398. Mature spores. × 1100.
- Fig. 399. Section of apothecium, the host surface indicated by dotted lines. × 385.
- Fig. 400. Development of ascus. × 1100.

Figs. 401–403. *Pyrenodesmia Darbishirei.*
- Fig. 401. Section through thallus. × 55.
- Fig. 402. Detail of basal cortex. × 735.
- Fig. 403. Detail of upper cortex. × 735.

Figs. 404–406. *Scopulariopsis brevicaulis.*
- Fig. 404. Conidia. × 1865.
- Fig. 405. Conidiophores and conidia. × 1100.
- Figs. 406a and b. *Botrytis* sp. Conidiophores and conidia. × 1865.

Fig. 407. *Hormiscium* sp. Hyphae. × 1100.

Fig. 408. *Rinodina* sp. Mature spores. × 1100; found in preparation of *Blastenia succinea* growing over *Umbilicaria cerebriformis* from Skua Gull Peak, *P. Siple & S. Corey 72W-15.* It is possible that some apothecium of *Rinodina* among those of *Blastenia* has been overlooked, as the material is scant and the apothecia are very small.



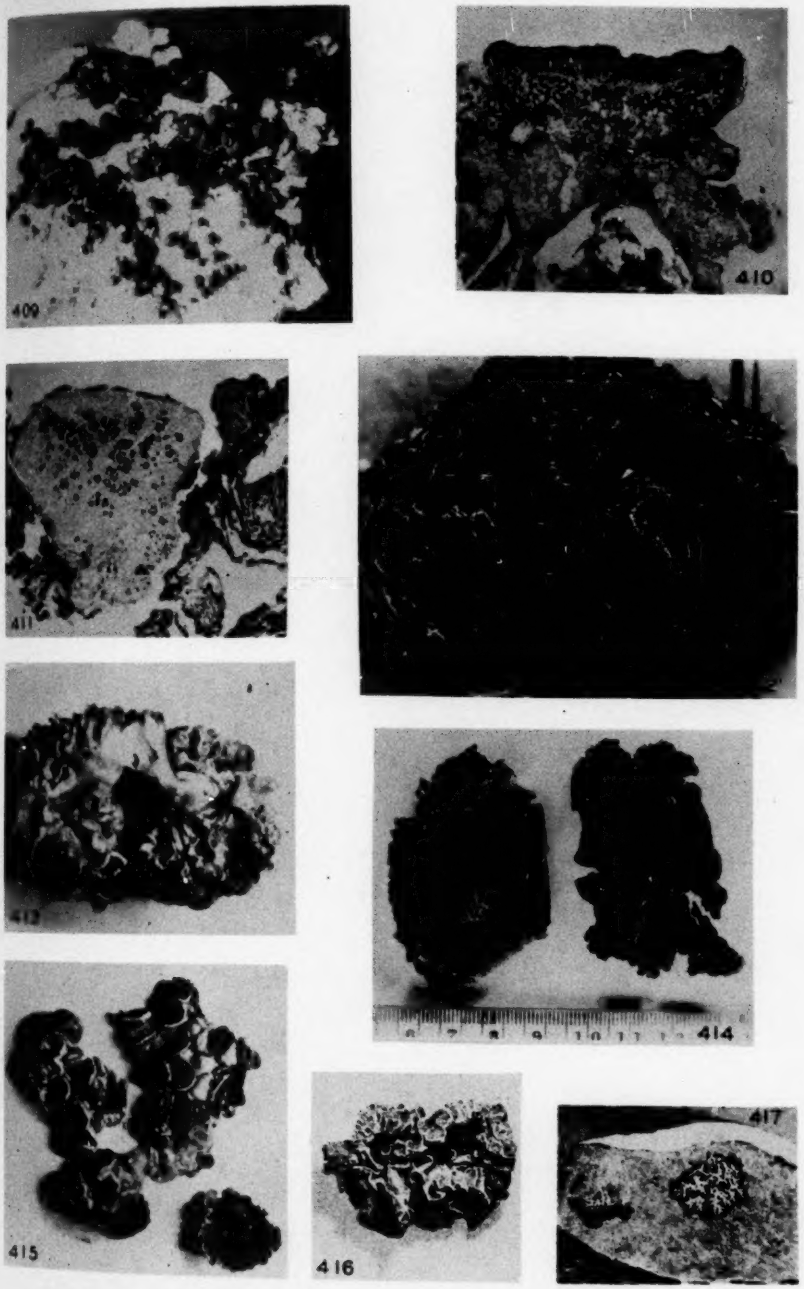
SECOND BYRD ANTARCTIC EXPEDITION

Explanation of Plate

PLATE 63

All photographs were made by Mr. Verne Goerger.

Fig. 409. *Lecidea cancriformis.* Apothecia and thalli from Queen Maud Mts.
Fig. 410. *Lecidea Siplei.* Section through apothecium.
Fig. 411. *Pyrenodesmia Darbishirei.* Section through thallus.
Fig. 412. *Umbilicaria cerebriformis.* Skua Gull Peak, Marie Byrd Land. Thallus.
Fig. 413. *Lecanora Siplei.* Apothecia.
Fig. 414. *Umbilicaria rugosa.* Thallus.
Fig. 415. *Lecanora Siplei.* Apothecia.
Fig. 416. *Umbilicaria rugosa.* Thallus, natural size.
Fig. 417. *Pannoparmelia pellucida* and *P. delicata.* Thallus, natural size.



SECOND BYRD ANTARCTIC EXPEDITION

EXPLANATION OF PLATE

PLATE 64

Fig. 418. *Pannoparmelia pellucida,* showing extensive hypothallus. × 8.

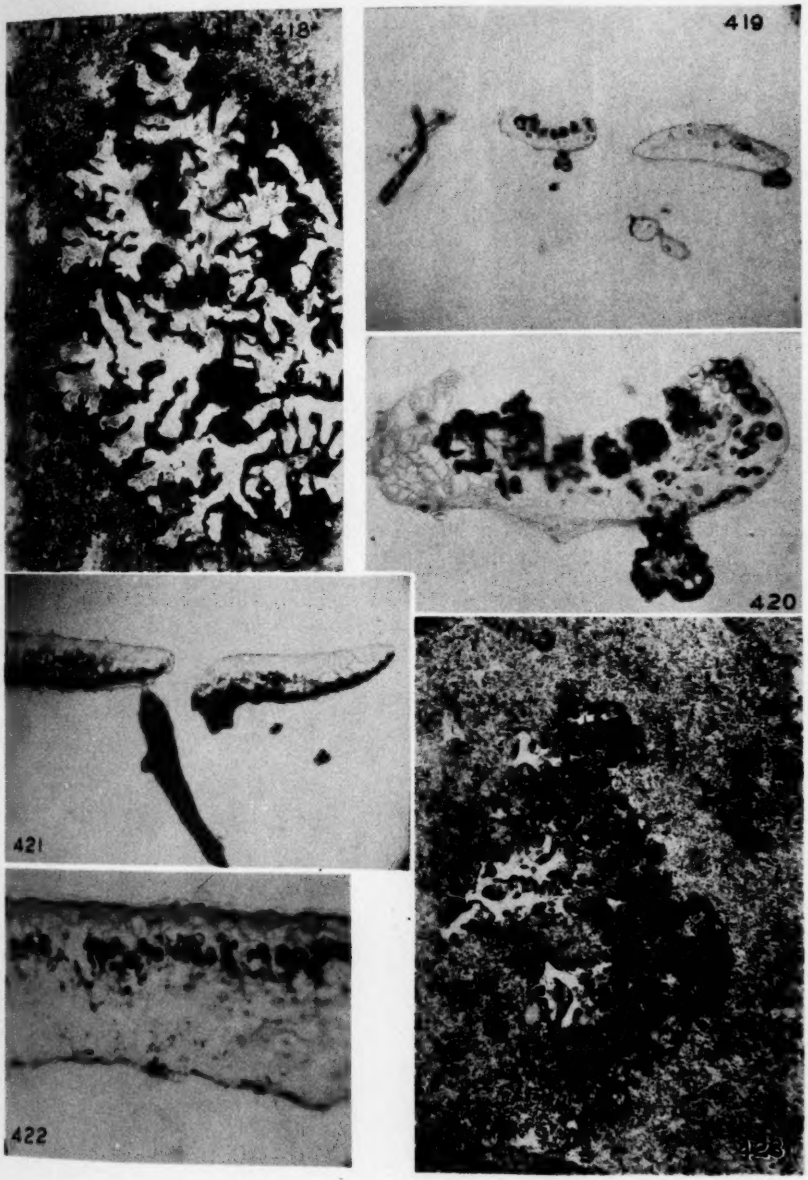
Fig. 419. *Pannoparmelia delicata,* section showing apothecium and lobe of thallus. × 115.

Fig. 420. *Pannoparmelia delicata,* section of apothecium, showing trace of hymenium, which is mostly replaced by soredia. Note large thick-walled dark cells at the right which may be a bit of cortex, or may belong to a parasite. × 500.

Fig. 421. *Pannoparmelia pellucida,* section through two lobes of thallus, showing a portion of a branching rhizina. × 800.

Fig. 422. *Pannoparmelia pellucida.* Details of thalline structure. × 2500.

Fig. 423. *Pannoparmelia delicata.* Thallus × 8.

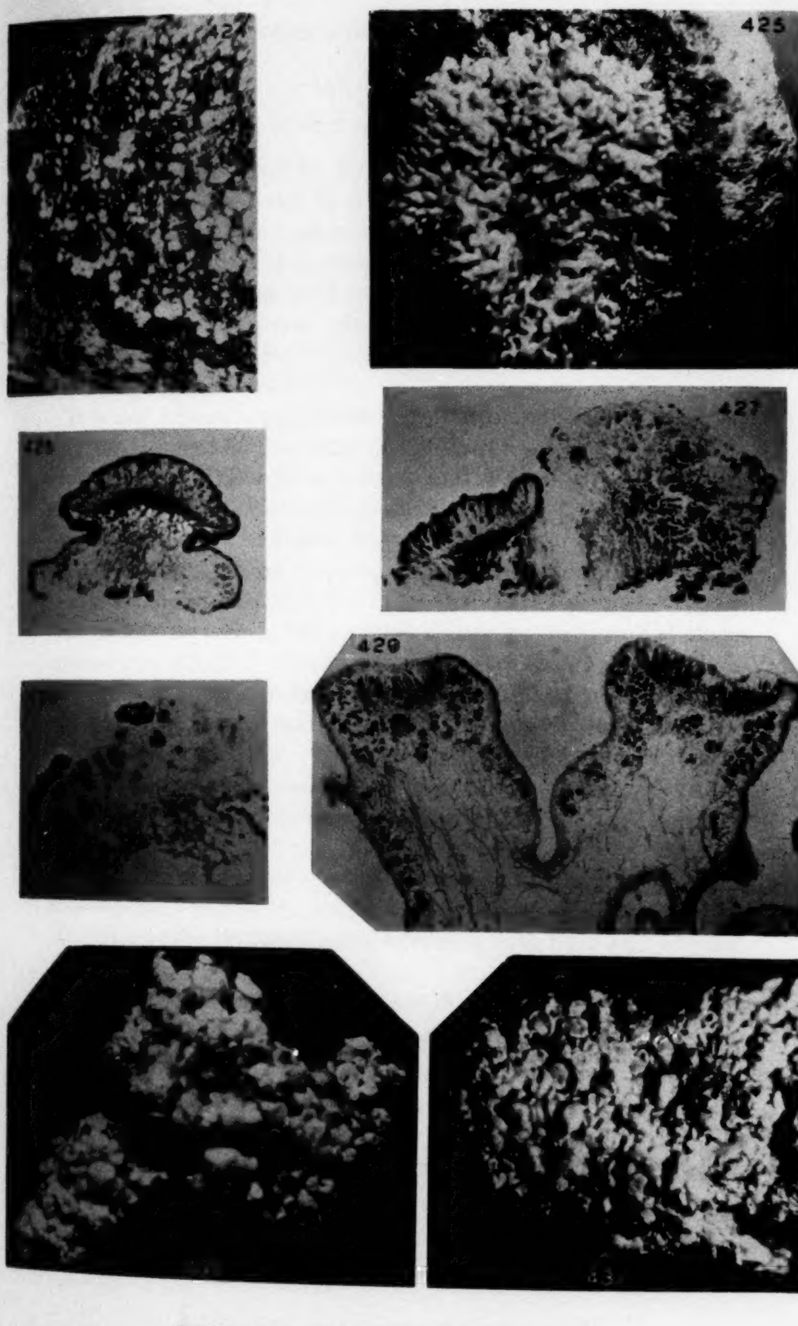


SECOND BYRD ANTARCTIC EXPEDITION

Explanation of Plate

PLATE 65

Fig. 424. *Buellia flavoplana.* Thallus on rock.
Fig. 425. *Kuttlingeria rufa.* Fruiting thallus on rock.
Fig. 426. *Rhizocarpon flavum.* Section of apothecium.
Fig. 427. *Buellia frigida.* Section of fruiting thallus.
Fig. 428. *Catillaria arachnoidea.* Section of thallus with apothecia.
Fig. 429. *Gasparrinia Siplei.* Thallus with apothecia in section.
Fig. 430. *Polycauliona pulvinata.* Fruiting thallus.
Fig. 431. *Gasparrinia Siplei.* Fruiting thallus.



SECOND BYRD ANTARCTIC EXPEDITION

III. Mosses

EDWIN B. BARTRAM

The mosses collected by Mr. Siple in Marie Byrd Land and King Edward VII Land in connection with the Second Byrd Antarctic Expedition represent five distinct species. *Grimmia Antarctici* is easily the dominant type, comprising the greater part of the collections both in number and quantity. *Barbula Byrdii* and *Sarconeurum glaciale* rank next in the order of abundance, and the two Bryums, *B. Siplei* and *B. antarcticum,* occur sparingly in small tufts.

It is not without significance that these mosses, in a broad way, are closely allied to some of the most cosmopolitan specific types such as *Grimmia apocarpa* and *Bryum argenteum.* A common origin within comparatively recent times is the inference that might be drawn from these facts.

Growing as they do on true nunataks surrounded by perpetual ice, hundreds of miles from the nearest known vegetation in any direction, the natural query is "where did these mosses come from?" Introduction through the agency of birds or by means of air currents is possible but hardly probable. A more likely theory is that these colonies are representative of a few extremely hardy, vigorous remnants of a former climax vegetation that have managed to maintain a hold on life in the face of increasingly rigorous conditions of almost unbelievable severity.

The types of the new species are in the writer's herbarium, and duplicate sets of the series will no doubt be distributed by Mr. Siple to the representative herbaria both here and abroad.

Tortulaceae

Sarconeurum glaciale (Hook. f. & Wils.) Card. & Bryhn, Nat. Antarct. [Discovery] Exp. Musci. 3. 1907.

Didymodon ? glaciale Hook. f. & Wils., Crypt. Bot. Antarct. Voy. Erebus & Terror. 102. *pl. 152. f. 6.* 1845.

Sarconeurum antarcticum Bryhn, Nyt Mag. Naturvidensk. 40: 205. 1902.

Type: Graham Land, Cockburn Island, 64° S., 57° W., *J. D. Hooker, S. antarcticum* based on S. Victoria Land, Geikie Land, Newnes Land, 6.5 m., *C. E. Borchgrevink.*

This species has been recorded from several stations in the Antarctic continent in addition to those listed here. It resembles *Tortula lithophila* Dus., of Fuegia, in some particulars but seems to be thoroughly distinct in the larger, arcuate-spreading, gradually acuminate leaves with larger and more coarsely papillose lamina cells. The fruit is unknown.

On highly metamorphosed slates and granite.

MARIE BYRD LAND: Edsel Ford Range, Lichen Peak, *P. Siple & S. Corey 46, 51, G-1; Skua Gull Peak, P. Siple & S. Corey 7a;* Mt. Corey, *P. Siple & S. Corey, 43a.*
SOUTH VICTORIA LAND: Geikie Land, Newnes Land, 6.5 m., *C. E. Borchgrevink.*

BARBULA **Byrdii** Bartram, sp. nov.

Type: Marie Byrd Land, Edsel Ford Range, Lichen Peak, *P. Siple & S. Corey G.*

Caespites brunneo-virides, compacti, intus radiculosi. Caules circa 1 cm. alti, parce ramosi. Folia minuta, erecto-patentia, sicca imbricata, vix 1 mm. longa et 0.5 mm. lata, ovata, concava, breviter et late acuminata vel acuta; marginibus recurvis, superne papilloso-crenulatis; costa valida, fusca, circa 60 μ lata, percurrente; cellulae superiores rotundato-quadratae, papillosae, 8–10 μ latae, basilares breviter rectangulares. Caetera ignota.

Densely tufted plants, dull brownish green. Stems erect, sparingly branched, to 1 cm. high, matted together with radicles below. Leaves small, erect and closely imbricated when dry, slightly erect-spreading when moist, scarcely 1 mm. long and 0.5 mm. wide, ovate, abruptly short-acuminate to acute, concave; margins erect and papillose-crenulate above, narrowly recurved in the median portion and erect and entire below; costa strong, brownish, ending in or just below the apex, papillose on both sides above, 50–60 μ wide, tapering slightly, if any, upward, in cross-section showing a median row of about five large guide cells with two layers of slightly smaller cells on the ventral side and about three layers of small, substereid cells on the dorsal side; upper cells small, obscure, papillose, irregularly rounded-quadrate, 8–10 μ in diameter, not incrassate, basal cells short-rectangular, smooth and pellucid near the insertion. Sporophyte unknown.

On highly metamorphosed slates and biotite sericite.

The broadly ovate, short-pointed leaves, with recurved margins and a strong percurrent costa, are typical of *Barbula* in a general way, but I know of no species in particular with which these plants might be closely compared. In some ways *Barbula Byrdii* is reminiscent of a small form of *Tortula atrovirens* (Sm.) Lindb. but the costa is not appreciably widened above and the structure in cross-section is quite different.

It is a privilege to associate Admiral Richard E. Byrd's name with this singular species, unlike any that has been described from Antarctica.

Marie Byrd Land: Edsel Ford Range, Lichen Peak, *P. Siple & S. Corey G*, type, *51a*; Skua Gull Peak, *P. Siple & S. Corey 1a, 4, 8, 99a*; Mt. Donald Woodward, *P. Siple, F. A. Wade, S. Corey & O. D. Stancliff 97a.*

Grimmiaceae

Grimmia Antarctici Cardot, Bull. Herb. Boissier. II. 6: 15. 1907.

Type: Graham Land, Louis Philippe Land, Cape Kjellman, *Skottsberg 448*, Ile Paulet, *Skottsberg 449*.

On biotite sericite, highly metamorphosed slates and granites.

The collections referred here vary widely in color, appearance, and habit, but after careful study I am convinced that they are all representative of one specific concept. The modifications are possibly the result of the varied and unusual conditions under which they manage to exist. Several well-developed capsules show the typical rudimentary peristome and, in the more luxuriant tufts, the characteristic spiral arrangement of the stem leaves is often very obvious.

From Skua Gull Peak, no. 1 is typical with several perfectly developed capsules; no. 99, plants developing numerous flagelliform microphyllous branches; no. 49, mixed with a small tuft of *Bryum Siplei;* no. 7, brownish green, well developed in luxuriant tufts about 2 cm. deep, stems copiously branched. A specimen from Chester Mts. or Skua Gull Peak is pale and considerably eroded but with stems to 1.5 cm. long, showing

spiral arrangement of the leaves to good advantage. From Chester Mts., no. 44 is in compact tufts, brown on the surface and blackish below, stems 2–2.5 cm. high, often with flagelliform branches; no. 40 is similar but slightly more robust and without the flagelliform branches. From Mt. Rea-Cooper, a bright vivid green form with short-tufted stem and flexuous, scarcely seriate leaves but structurally identical with the typical form; no. 2, a form with strongly sinuose leaf cells, almost rhacomitrioid in appearance but lacking the long hyaline hair points of var. *pilifera*. From Mt. Corey, No. 43 is brownish green, leaves slightly seriate, ovate-lanceolate, epilose or with a very short hyaline tip, flagelliform branches numerous; no. 97, Mt. Donald Woodward, a mixture of plants with epilose leaves and flagelliform lateral branches and the var. *pilifera* with hyaline-tipped leaves and the lamina cells strongly sinuose. From the more distant Mt. Helen Washington, no. 68 is a slender densely tufted form, olive green above and dark brown or blackish below, leaves mostly rounded at the tip and the costa vanishing well below the apex; no. 76 is well developed and fairly robust, golden brown, stems with numerous short tumid branches; no. 100a, relatively slender plants with numerous lateral flagelliform branches and with the terminal branches often short and congested in a capitulate cluster.

MARIE BYRD LAND: Edsel Ford Range, Skua Gull Peak, *P. Siple & S. Corey 1, 7, 49, 99*; Chester Mts., *P. Siple & S. Corey 40, 44*; Mt. Rea-Cooper, *P. Siple, F. A. Wade, S. Corey & O. D. Stancliff 2, 98a*; Mt. Corey, *P. Siple & S. Corey 43*; Mt. Donald Woodward, *P. Siple, F. A. Wade, S. Corey & O. D. Stancliff 97.*

KING EDWARD VII LAND: Rockefeller Mts., Mt. Helen Washington, *P. Siple, F. A. Wade, S. Corey & O. D. Stancliff 68, 76, 100a.*

var. **pilifera** Bartram, var. nov.

Type: Marie Byrd Land, Edsel Ford Range, Mt. Rea-Cooper, *P. Siple, F. A. Wade, S. Corey & O. D. Stancliff 27.*

Folia in pilum hyalinum producta; cellulae valde sinuosae.

Leaves with hyaline hair tips; lamina cells strongly sinnose. Leaves slightly seriate and with long conspicuous, hyaline tips, giving the tufts a hoary aspect very similar to some species of *Rhacomitrium*, lateral cell walls very sinuose.

On coarse-grained pink granite and biotite-sericite schist.

MARIE BYRD LAND: Edsel Ford Range, Mt. Rea-Cooper, *P. Siple, F. A. Wade, S. Corey & O. D. Stancliff 27, 98*, type; Mt. Donald Woodward, *P. Siple, F. A. Wade, S. Corey & O. D. Stancliff 97*, in part.

var. **percompacta** Bartram, var. nov.

Humillima, caespites perdensi.

Very small, compactly tufted plants, bright reddish brown; stems 4–5 mm. long, with short clustered branches above. Leaves often hyaline-bordered in the upper half and slightly toothed near the apex; margins nearly or quite plane. A singular form, widely different in appearance but without any constant structural differences of importance.

On coarse-grained granite.

KING EDWARD VII LAND: Rockefeller Mts., Mt. Helen Washington, *P. Siple, F. A. Wade, S. Corey & O. D. Stancliff 68a.*

BRYACEAE

BRYUM (ARGYROBRYUM) **Siplei**, Bartram, sp. nov.

Type: King Edward VII Land, Rockefeller Mts., Mt. Helen Washington, *P. Siple, F. A. Wade, S. Corey & O. D. Stancliff 100.*

Gracile, compacte caespitosum, caespites superne virentes, intus fusco-radiculosi. Caules ad 8 mm. alti, parce ramosi, in axillis superioribus, propagula ovata stipitata foliolis 4–6 ornata gerentes. Folia ovata, acuminata, concava, integra, superne hyalina, inferne chlorophyllosa; costa infra apicem evanida vel excurrente; cellulae superiores elongatae, irregulariter rhomboideae, hyalinae, inferiores rectangulares, chlorophyllosae, margines versus subquadratae.

Slender, compactly tufted plants, silvery green above, pale brown below. Stems sparsely branched, to 8 mm. high, erect, radiculose below, often with ovate, stalked gemmae bearing 4–6 rudimentary leaves in the axils of the upper stem leaves. Leaves rather congested toward the tips of the stems, more scattered below, ovate, concave, gradually acuminate, entire, colorless in the upper half, chlorophyllose below; costa slender and faint, ending below the apex in the lower leaves but often excurrent in the comal leaves; upper hyaline leaf cells irregularly rhomboidal, elongate, lower cells chlorophyllose, rectan-

gular, usually subquadrate toward the margins. Sporophyte unknown.

On coarse-grained granites and highly metamorphosed slates.

Except for the axillary gemmae the differences between this species and the world-wide *Bryum argenteum* Hedw. are slight and of little importance. I take pleasure in naming this plant for Mr. Paul A. Siple, to whom we are indebted for these unusual collections.

KING EDWARD VII LAND: Rockefeller Mts., Mt. Helen Washington, *P. Siple, F. A. Wade, S. Corey & O. D. Stancliff 100*, type.

MARIE BYRD LAND: Edsel Ford Range, Skua Gull Peak, *P. Siple & S. Corey 49* in part.

BRYUM ANTARCTICUM Hook. f. & Wils., Crypt. Bot. Antarct. Voy. Erebus & Terror. 108. *pl. 153. f. 6.* 1845.

Bryum austropolare Cardot, Rev. Bryol. **27**: 45. 1900.

Type: Graham Land, Cockburn Island, 64° S., 57° W., *J. D. Hooker. B. austropolare* was based on Graham Land, Danco Land, Cape Anna Osterrieth, *Racovitza 151b, 151c, 205a,* and Cape Van Beneden, *Racovitza 233b, 234b.*

In small weathered tufts, on highly metamorphosed slates.

As far as this material is concerned it corresponds exactly with the description and illustration of *B. austropolare* Card. but this name is probably, as Mr. Dixon has suggested, a synonym of *B. antarcticum* (Australasian Ant. Exp. 1911–14, Sci. Rept. C. Zoology and Botany **7**: 7. 1918).

MARIE BYRD LAND: Edsel Ford Range, Skua Gull Peak, *P. Siple & S. Corey 49a, 72.*

IV. INDEX

New species, new combinations, and pages on which species are described are printed in **bold face** type; synonyms and page numbers having reference to plates in *italics;* and previously published and accepted names in ordinary type.